NASA Acquisition Pollution Prevention Program Office
Kennedy Space Center, FL 32899

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FY04 Core Support for the NASA Acquisition Pollution Prevention (AP2) Program and Projects at the John F. Kennedy Space Center (KSC), FL

Status Report #2
October 15, 2004

NASA Contract: NAS10-03029
Task Order No. 6

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Executive Summary

NASA Headquarters established the NASA Acquisition Pollution Prevention (AP2) Program Office in 1998 to help NASA Enterprises, Programs and Centers qualify and implement replacement materials or processes that reduce and eliminate the uses of hazardous materials (HazMats). As the support contractor to the AP2 Office, ITB staff provides engineering, technical and administrative program and project management support to the AP2 Program manager. This report covers ITB's performance under Task Order No. 6 for the period July 1 to September 30, 2004. The NASA AP2 Program operates in three distinct business entities:

- Agency,
- NASA / DoD, and
- NASA / International.

During this reporting period, ITB provided core program support across all three (3) business entities (NASA, DoD, and International). Activities included but were not limited to:

- Efforts required to complete appropriate research, program and project development;
- Analyses, risk and quality assessments;
- Strategic planning;
- Customer relations and Outreach; and
- Information management and website support and maintenance.

In support of the Agency business entity, ITB continued progress on its active projects, including supporting a new project between Kennedy Space Center and Glenn Research Center to evaluate portable laser coating removal systems for NASA. This new project exemplifies migration of DoD-tested technology to NASA.

On the joint NASA-DoD Lead-Free Solder project, critical milestones were reached in completing assembly of all test boards and beginning testing. ITB facilitated a technical team meeting in Melbourne, FL in September to review team progress to date. ITB efforts also focused on identifying possible future lead-free solder project ideas.

In support of the international business entity, ITB engineers attended both executive and project level meetings in Portugal (July 2004) with NASA KSC and NASA HQ representatives. The July Portugal trip was instrumental in addressing Portuguese and European stakeholder issues and gaining commitment on current and future efforts. ITB made subsequent progress in helping TAP and OGMA make plans for applying a low-VOC and non-chrome coating system on a commercial aircraft next quarter.

In September, ITB provided coordination and support of C3P activities in Florida, most notably a meeting of the C3P Joint Oversight Group and a two-day international pollution prevention workshop. ITB responded to C3P with a list of possible project areas for C3P to pursue in 2005. Outcomes from the workshop included expansion in the number of stakeholders involved in projects as well as identification of several possible new project opportunities. Feedback on the workshop was very positive.

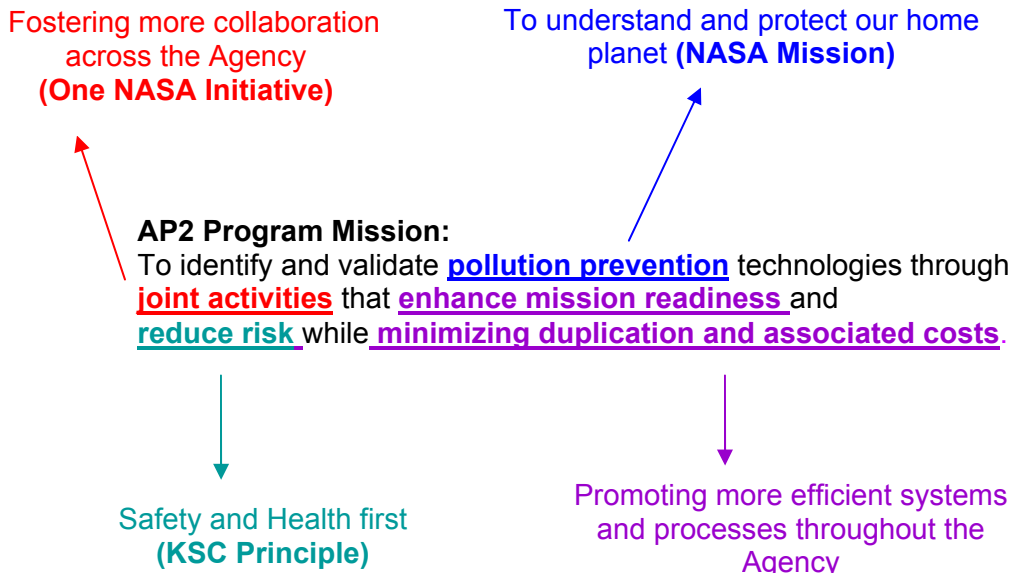
The following Status Report provides detailed information regarding all activities supported by ITB during this period of performance.

Status Report

This Status Report for the NASA AP2 Program covers the period of July 1 through September 30, 2004. The report is divided into four major sections:

1. Core Program Support;
2. Agency Business Entity Support;
3. DoD Business Entity Support; and
4. International Business Entity Support.

The AP2 Program mission directly relates to the NASA mission, the One NASA Initiative, and Kennedy Space Center (KSC) Principles by focusing on collaboration between centers in identifying and testing more environmentally friendly technologies.



In enacting its mission, the NASA AP2 Program operates in three distinct business entities:

- Agency;
- NASA / DoD; and
- NASA / international.

The AP2 Office provides engineering, technical and administrative program and project management support. Projects may be exclusive to each business entity or shared by two or more in keeping with the Program's mission to identify common environmental issues and work collectively to find solutions that reduce duplication of effort, costs and technical risks.

A. Core Program Support

The objective of core program support is to establish and sustain a robust, core infrastructure that supports all necessary AP2 program and project functions. As such, core program support activities are shared across and benefit program business entities (NASA, DoD, and International).

The knowledge, skills, and abilities of the ITB contractors supporting the NASA AP2 Office allowed the Program to meet its mission of helping NASA Enterprises, Programs, and Centers qualify and implement less hazardous materials and/or processes. During this reporting period, the NASA AP2 Office was supported by the following personnel:

- ITB Program Manager: Mr. Brian Greene
- Program Analyst: Ms. Katherine Torres
- Engineers:
  - Mr. Kevin Andrews
  - Mr. Kurt Kessel
  - Mr. Matt Rothgeb
  - Ms. Pattie Lewis
  - Mr. John Herrington
- Web/Database and Administrative Specialist: Ms. Cassandra Carroll.

Collectively, these personnel interfaced with senior NASA and DoD program and technical representatives, international executives, scientists, engineers, and numerous subject matter experts in the day-to-day development of program and project requirements and activities.

The core program support activities performed by the AP2 staff can be generally categorized as follows:

1. Program administration
2. Regulatory review
3. Information management
4. Outreach

Achievements and highlights under each of these four categories are discussed below.

1. Program Administration

Program administration is a primary function of Ms. Torres, with additional support from Ms. Carroll. This function is critical to ensuring the effective and continuous direction and control of the AP2 Program. In this capacity, ITB planned and coordinated program scheduling, budgeting, and administrative tasks. Routine activities included:

- Maintenance of all necessary electronic tools and support material at Kennedy Space Center and the ITB Merritt Island office with no down time;
- Tracking travel and materials budgets for proper program supportability; and
- Facilitation of program logistics, such as meetings and conference calls, taking meeting minutes and action items during meetings and performing basic follow-up, and assisting in development of presentations.

Notable administrative achievements follow.

During this reporting period, over 62 events were identified, scheduled, and attended by one or more ITB staff members and/or Ms. Christina Brown, NASA AP2 Program Manager (Table 1).

Table 1 - NASA AP2 Calendar of Events

Entity	Teleconferences	Meetings	Conferences/Workshops
NASA	15	5	12
JG-PP	6	14	2
C3P	2	5	1
Total	22	32	8

Program and project events from the AP2 calendar were also transcribed to the NASA AP2 Web site, www.acqp2.nasa.gov.

ITB prepared and submitted the following PowerPoint briefings in support of Agency, DoD, and International program-level activities:

- "Review of the C3P/PoAF Project Initiative," (C3P Semi-Annual Project Review/ LFS Project Meeting, Lisbon, Portugal, July 2004)
- "Path to Lead-Free Solder Implementation," (JCAA Lead-Free Solder Project Business Meeting, Wright-Patterson AFB, OH, August 2004)
- "Joint Group on Pollution Prevention (JG-PP): Reducing Costs through Partnering," (SOLE 2004 39th Annual International Conference and Exhibition, Norfolk, VA, 29 August - 2 September 2004)
- "NASA Acquisition Pollution Prevention Program (AP2), " (KSC Environmental Council Meeting, Cape Canaveral, FL, September 2004)
- "NASA Acquisition Pollution Prevention Program, " (2004 International Pollution Prevention Workshop, Cape Canaveral, FL, September 2004)
- "C3P Joint Oversight Group (JOG) Considerations for FY2005," (2004 International Pollution Prevention Workshop, Cape Canaveral, FL, September 2004)
- "Path to Lead-Free Solder Implementation," (2004 International Pollution Prevention Workshop, Cape Canaveral, FL, September 2004)

Presentations are available upon request.

ITB tracked all travel planned and made by staff. The following chart (Table 2) chronologically lists trips made during the reporting period under each of the business entities (See Appendix A for trip reports). The total number of person-trips was 11, of which 2 were international.

Table 2 - NASA AP2 Task Order #6 ITB Staff Travel History

Location	Description	Date	Travelers			
			Core	NASA	DoD	Int'l
			1 9%	1 9%	7 64%	2 18%
Louisville, KY	National Association of Corrosion Engineers (NACE) Rust Corrosion Technology Exchange 2004 Conference	Jul-04		1		
Lisbon, Portugal	C3P Semi-Annual Project Review/ LFS Project Meeting	Jul-04				2
Cedar Rapids, IA	Lead-Free Solder Project Site Visit, Rockwell Collins Facility	Jul-04			1	
Dayton, OH	JCAA Lead-Free Solder Project Business Meeting	Aug-04			2	
Dayton, OH	Portable Laser Coatings Removal Systems (PLCRS) Meeting	Aug-04			1	
Renton, WA	Lead-Free Solder Project Site Visit, Boeing Phantom Works	Aug-04			1	
Orlando, FL	Software Training Workshop	Aug-04	1			
Norfolk, VA	Society of Logistics Engineers (SOLE) Conference	31 Aug – 2 Sep-04			1	
Crystal City, WA	National Defense Center for Environmental Excellence (NDCEE) and Information Exchange Meeting	Sep-04			1	

11 total travelers

The ITB Program Analyst maintained virtually all Microsoft Outlook e-mail distribution lists with the exception of those distribution lists for Agency and international projects, which were maintained by ITB technical staff (Table 3). ITB also continued to update the project points of contact list for each NASA Center.

Table 3 – E-mail Distribution Lists

Distribution List	Number of Members
JG-PP Working Group and Assistants	42
JG-PP Execution Committee (Solvent Substitution)	27
JG-PP Project Selection Committee (Coatings)	30
JCAA/JG-PP Lead-Free Solder	209
Shuttle Environmental Assurance (SEA)	85
Isocyanate Coatings/Depainting Project	43

2. Regulatory Review

ITB provided regulatory support by reviewing applicable regulations, Executive Orders, NASA guides, handbooks, and international policies. Highlights follow.

The Shuttle Environmental Assurance (SEA) group has been following a proposed Occupational Health and Safety Agency (OSHA) regulation to reduce the Permissible Exposure Limit (PEL) for hexavalent chrome. Ms. Lewis continues to review all distributed information.

Brominated Flame Retardants (BFRs) have also come to the attention of the SEA group. Ms. Lewis did research regarding the current and possible future regulation of BFRs and continues to keep abreast of any new developments in this area.

Brian Greene (with engineering staff supported) provided a response to General Branco, Director General C3P, asking for opinions on the aerospace impact of the Waste Electrical and Electronic Equipment (WEEE) directive. The directive seeks to restrict the use of hazardous substances in electrical and electronic equipment.

3. Information Management

ITB developed, analyzed, and maintained various information management systems such as the AP2 Web Site, Center for Pollution Prevention (C3P) Web Site, the Pollution Prevention Integrated Technology Database (ITDb), Document Control System (DCS), and Kennedy Space Center Projects and Resources Online (KPRO). Following are specific achievements.

Web Sites

During this reporting period, Ms. Carroll loaded numerous updates which were made to the AP2 web site concerning the September International Pollution Prevention Workshop. These updates included technical session information, the workshop agenda, attendee registration, tour information, as well as tour registration. Updates were also posted to the web site after Hurricanes Francis and Jeanne struck the area in the weeks prior to the workshop assuring attendees that the workshop was still going on as scheduled. After the conclusion of the workshop, the process began to upload

approved workshop presentations in .PDF format. As of the end of this period all changes are under review with Ms. Christina Brown.

All necessary updates were made to the Events Calendar to reflect all NASA, DoD and International activities and teleconferences for the reporting period.

Integrated Technology Database

The ITDb is hosted by a third party provider and can be viewed at http://www.ap2-itd.com/ . ITB staff has been updating the ITDb application in order to make the tool a more robust and usable tool during this reporting period.

On the following page is the latest schedule for implementing the Database (Figure 1).

Reorganization of the ITDb content and categories:

Initial planning for restructuring of the Integrated Technology Database is being performed on paper, prior to implementation of said changes to the online version of the database. Changes currently planned include reduction of Site Categories to reduce duplicity within NASA and DoD locations. Currently the AP2 Office is working with KSC environmental contractors via the Environmental Solutions Partners (ESP) group to determine if the ITDb can be altered to fit the need of a common needs database among KSC Environmental Contractors. In order to accomplish this objective, it may be necessary to condense all NASA Location Categories into a One NASA Category.

A proposed new Category is Best Management Practice Opportunities. This new category will hold all opportunities currently found in the database that represent best management practices and drop-in replacements. Additionally, it will allow all of the DoD's primary categories to only hold demonstration/validation related opportunities for more critical processes within NASA and the DoD.

On August 26, Cassandra Carroll, Matt Rothgeb, John Herrington and Brian Greene met with members of KSC's ESP group to discuss opportunities for partnership with the AP2 Office and to demonstrate the ITDb for the group. Due to conference room scheduling, the internet was not available, but handouts of examples from the ITDb were distributed to the group for discussion. The group noted that a database similar to this may be of great interest if it can be adapted slightly to better fit their needs. The ITDb will be presented in its streamlined form for the next ESP meeting, currently scheduled for October 20, 2004.

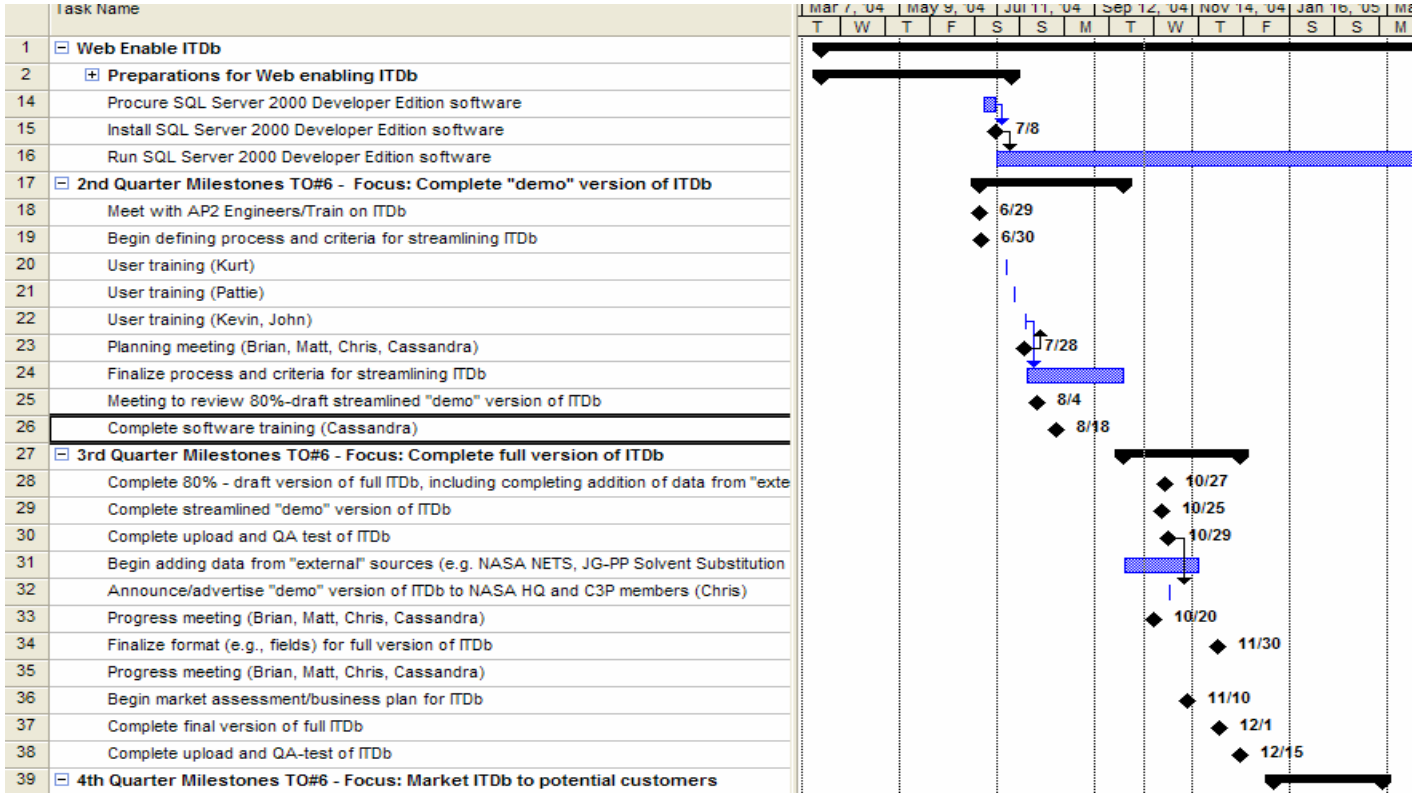
Document Control System

The DCS provides for a central repository of all important documents generated by the NASA AP2 Program personnel. During this reporting period, ITB staff submitted 39 new documents which were assigned a tracking number and entered into the DCS by Ms. Carroll. The total number of documents now stored in the DCS is 163. A bi-weekly back-up CD of the DCS is stored at the ITB South Office.

Kennedy Space Center Projects and Resources Online (KPRO)

KPRO is a centralized project management information system which allows for real-time updating of budget information, status reporting, document sharing, and project schedules. The initial NASA AP2 Program schedule has been loaded into the KPRO system. Ms. Carroll and Ms. Brown met in August 2004 and further refined the program schedule data. Ms. Carroll and Ms. Brown will continue to meet periodically in order to update the program schedule.

Figure 1 – P2 Integrated Technology Database Schedule



	Task Name
1	**Web Enable ITDb**
2	**Preparations for Web enabling ITDb**
14	Procure SQL Server 2000 Developer Edition software
15	Install SQL Server 2000 Developer Edition software
16	Run SQL Server 2000 Developer Edition software
17	**2nd Quarter Milestones TO#6 - Focus: Complete "demo" version of ITDb**
18	Meet with AP2 Engineers/Train on ITDb
19	Begin defining process and criteria for streamlining ITDb
20	User training (Kurt)
21	User training (Pattie)
22	User training (Kevin, John)
23	Planning meeting (Brian, Matt, Chris, Cassandra)
24	Finalize process and criteria for streamlining ITDb
25	Meeting to review 80%-draft streamlined "demo" version of ITDb
26	Complete software training (Cassandra)
27	**3rd Quarter Milestones TO#6 - Focus: Complete full version of ITDb**
28	Complete 80% - draft version of full ITDb, including completing addition of data from "exte
29	Complete streamlined "demo" version of ITDb
30	Complete upload and QA test of ITDb
31	Begin adding data from "external" sources (e.g. NASA NETS, JG-PP Solvent Substitution
32	Announce/advertise "demo" version of ITDb to NASA HQ and C3P members (Chris)
33	Progress meeting (Brian, Matt, Chris, Cassandra)
34	Finalize format (e.g., fields) for full version of ITDb
35	Progress meeting (Brian, Matt, Chris, Cassandra)
36	Begin market assessment/business plan for ITDb
37	Complete final version of full ITDb
38	Complete upload and QA-test of ITDb
39	**4th Quarter Milestones TO#6 - Focus: Market ITDb to potential customers**

4. Outreach

ITB developed and maintained professional networks with individuals across the Agency, the Department of Defense, and internationally in an effort to increase the visibility of the AP2 Program and ultimately to help identify potential joint projects and/or stakeholders. Such networking occurred through established relationships with NASA organizations, such as SEA; DoD organizations, such as JG-PP; and pubic and private organizations in Europe.

Another important avenue for marketing continued to be attendance at technical meetings, conferences, and workshops. ITB attended the following 10 technical meetings, conferences, and workshops during this reporting period (Table 4):

Table 4 - NASA AP2 Attendance at Technical Meetings, Conferences, and Workshops

Event	Location	Date
National Association of Corrosion Engineers (NACE) Rust Corrosion Technology Exchange 2004 Conference	Louisville, KY	Jul-04
C3P Semi-Annual Project Review/ LFS Project Meeting [a]	Lisbon Portugal	Jul-04
Lead-Free Solder Project Site Visit, Rockwell Collins Facility	Cedar Rapids, IA	Jul-04
JCAA Lead-Free Solder Project Business Meeting [a]	Dayton, OH	Aug-04
Portable Laser Coatings Removal Systems (PLCRS) Meeting	Dayton, OH	Aug-04
Software Training Workshop	Orlando, FL	Aug-04
Lead-Free Solder Project Site Visit, Boeing Phantom Works	Renton, WA	Aug-04
Society of Logistics Engineers (SOLE) Conference [a]	Norfolk, VA	31 Aug – 2 Sep-04
National Defense Center for Environmental Excellence (NDCEE) and Information Exchange Meeting	Crystal City, WA	Sep-04
2004 International Pollution Prevention Workshop [a]	Cape Canaveral, FL	Sep-04

[a] PowerPoint presentations made by ITB-AP2 staff at these events

ITB staff monitored pollution prevention needs and the state of possible solutions while attending the above technical meetings, conferences and workshops. Each event is fully detailed in a trip report (See Appendix A) or in meeting minutes (available upon request).

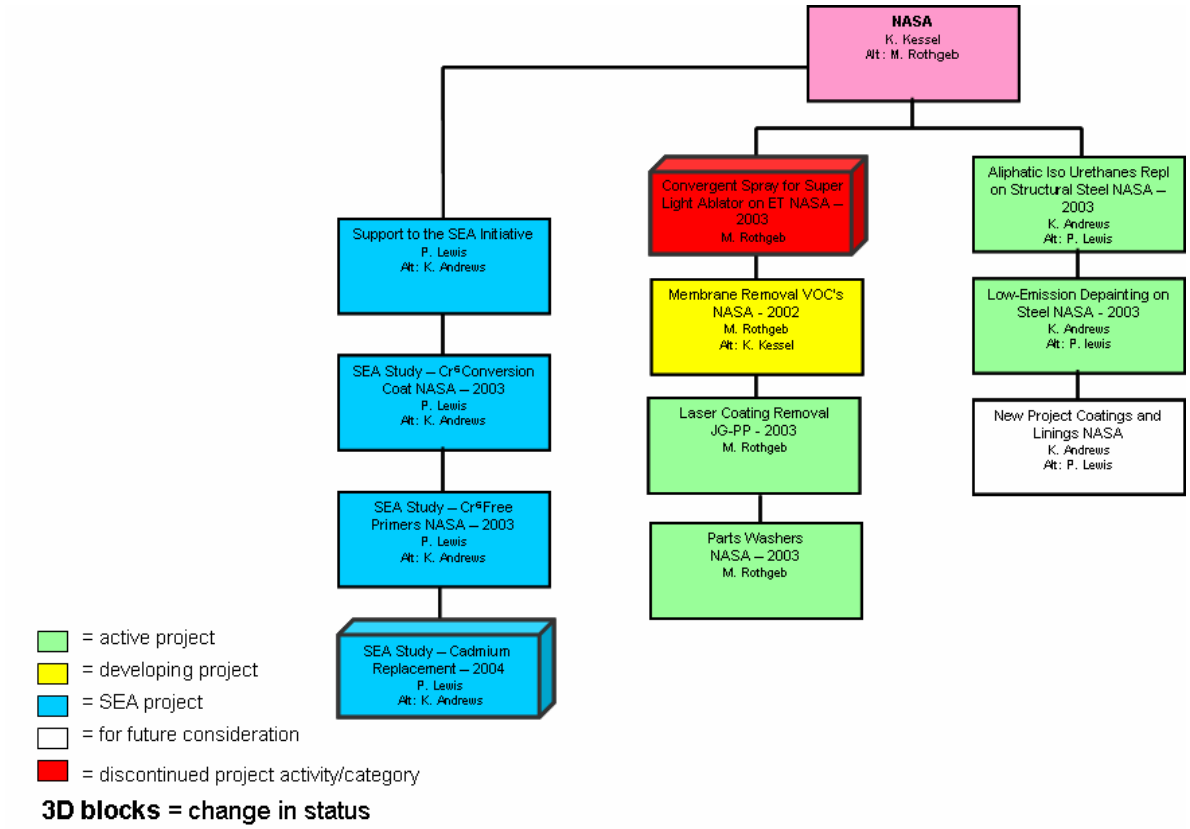
One result of the outreach conducted by ITB has been the building of new relationships around the nation and the world. For example, the NASA AP2 Program has established visibility into the Air Force Corrosion prevention network, and is now a key contributor in the identification of corrosion mitigation plans and projects that benefit both the Air Force and NASA. This relationship has resulted in the identification of two potential new projects for 2005 and continues to act as an additional technical resource in the NASA AP2 arsenal.

B. Agency Business Entity

The objective of the Agency business entity is to encourage and lead joint P2 efforts to reduce hazardous materials across multiple NASA Centers and Programs. ITB's goals for Task Order #6 are to meet the objectives and milestones on current Agency projects, and to begin up to two (2) new Agency projects in 2004.

Figure 2 depicts the ITB engineering assignments of the Agency projects that are active or under development, along with several other ideas for future project consideration.

FIGURE 2 - NASA Project Opportunities and ITB POCs



The following table (Table 5) summarizes the status of project technology reports for the three active ("green") Agency projects.

Table 5 - NASA AP2 Project Report Summary

AP2 Project	JTP [a]	PAR	CBA	JTR
Identification, testing and validation of alternatives to aliphatic isocyanate urethanes on carbon steel structural elements across NASA (Test Stands and Shuttle Support) and in support of AFSPC operations.	Working on Final Drafts of JTP and Field Test Plan	The down selection process of potential alternatives is being documented for the final draft of the PAR	Collecting data to pen CBA	Testing has not begun yet, awaiting project approval and resource commitment
Identification, testing and validation of low-emission surface preparation/ depainting technologies for carbon steel structural elements across NASA (Test Stands and Shuttle Support), and in support of AFSPC operations.	Working on Final Drafts of JTP and Field Test Plan	The down selection process of potential alternatives is being documented for the final draft of the PAR	Collecting data to pen CBA	Testing has not begun yet, awaiting project approval and resource commitment
Identification and validation of alternative parts-washing technologies	Draft of possible testing procedures needed to validate a cleaner was developed in May of 2004. Additionally, a model for personnel interviews was developed and accepted by the group in June of 2004. A demonstration plan is being developed that will include three Centers and up to 10 parts washers for the first phase.	Vendors have been contacted and all stakeholders have responded with their current parts washer inventories. PAR is being built currently. Initial vendor list is being reduced prior to PAR being completed.	Awaiting PAR and parts washer demonstrations before beginning CBA.	Testing to begin in August and September of 2004.
Portable Laser Coating Removal Project for NASA Applications	Standards and test requirements are currently being researched and collected.	Two lasers from the JG-PP PLCRS Project are being suggested for the project. Other laser systems are also being considered, including one used at WPAFB in early research for the PLCRS project.	Awaiting PAR and JTP creation.	Testing dates have yet to be scheduled. Testing could begin as early as November or December of 2004.

[a] A 2nd Draft of a JTP for the use of convergent spray technology to apply SuperLight Ablator to the External Tank was completed and distributed to stakeholders for review, but this project has been discontinued.

In summary, with these projects, ITB staff is fostering cooperation between NASA Centers to reduce their hazardous material profiles, in the process epitomizing the "One NASA" objective.

The following sections provide more information on all the NASA projects, including Task Order #6 achievements and schedule.

1. Active NASA Projects

Since the start of Task Order #6, ITB has managed three (3) Agency projects:

1. Alternatives to Aliphatic Isocyanate Urethanes
2. Low Emission Depainting on Steel
3. Parts Washer Alternatives

One effort---the NASA Portable Laser Coating Removal Project—is on the cusp on being ready to be labeled an active project, but for now is discussed under “developing” projects.

Following is an overview of each project, along with achievements:

a. Alternatives to Aliphatic Isocyanate Urethanes

Background/ Need
NASA widely uses paints containing isocyanate urethanes on structural and non-structural elements in both shuttle and non-shuttle programs. Due to the toxicity of isocyanates, these paints are hazardous to workers and the painting operations are regulated under Occupational Safety and Health Administration (OSHA), National Institute for Occupation Safety and Health (NIOSH), and American Conference of Governmental Industrial Hygienists (ACGIH). An alternative paint that does not contain isocyanates, but which performs acceptably is desired.

Objective
Validate alternatives to isocyanate urethane coatings.

Stakeholders
Kennedy Space Center, Stennis Space Center, Air Force Space Command

Achievements

- JTP and Field Test Plan: Stakeholder comments of previous drafts are now being incorporated into the final drafts for distribution and final approval. This remains an iterative process that has been affected by the quality and responsiveness of stakeholder feedback. ITB engineers recognize that stakeholder resources have been affected by return to flight issues and natural disasters, and are forced to accommodate these impacts.
- PAR: Potential alternatives previously identified were further evaluated by the technical stakeholders. Based on this evaluation, several alternatives were removed from further consideration. More detailed Environmental, Safety, and Occupational Health (ESOH) and cost analyses of the remaining alternatives are currently underway and will be included in the final draft.

Problems Resolved

- Funding for the first stage in the project has been obtained and obligated, i.e., for procurement/preparation of panels and initial laboratory screening of alternative coating systems. The KSC Corrosion Testbed Facility (operated by ASRC) has been identified as an approved laboratory by the project stakeholders, and thus contracted to conduct initial laboratory screening of the potential alternative coatings systems.

Current Problems

- Cradle to grave funding for this project remains under resolution with funding through the Shuttle program (PH) and AFSPC currently being

explored.

Travel

- No travel to report during this period.

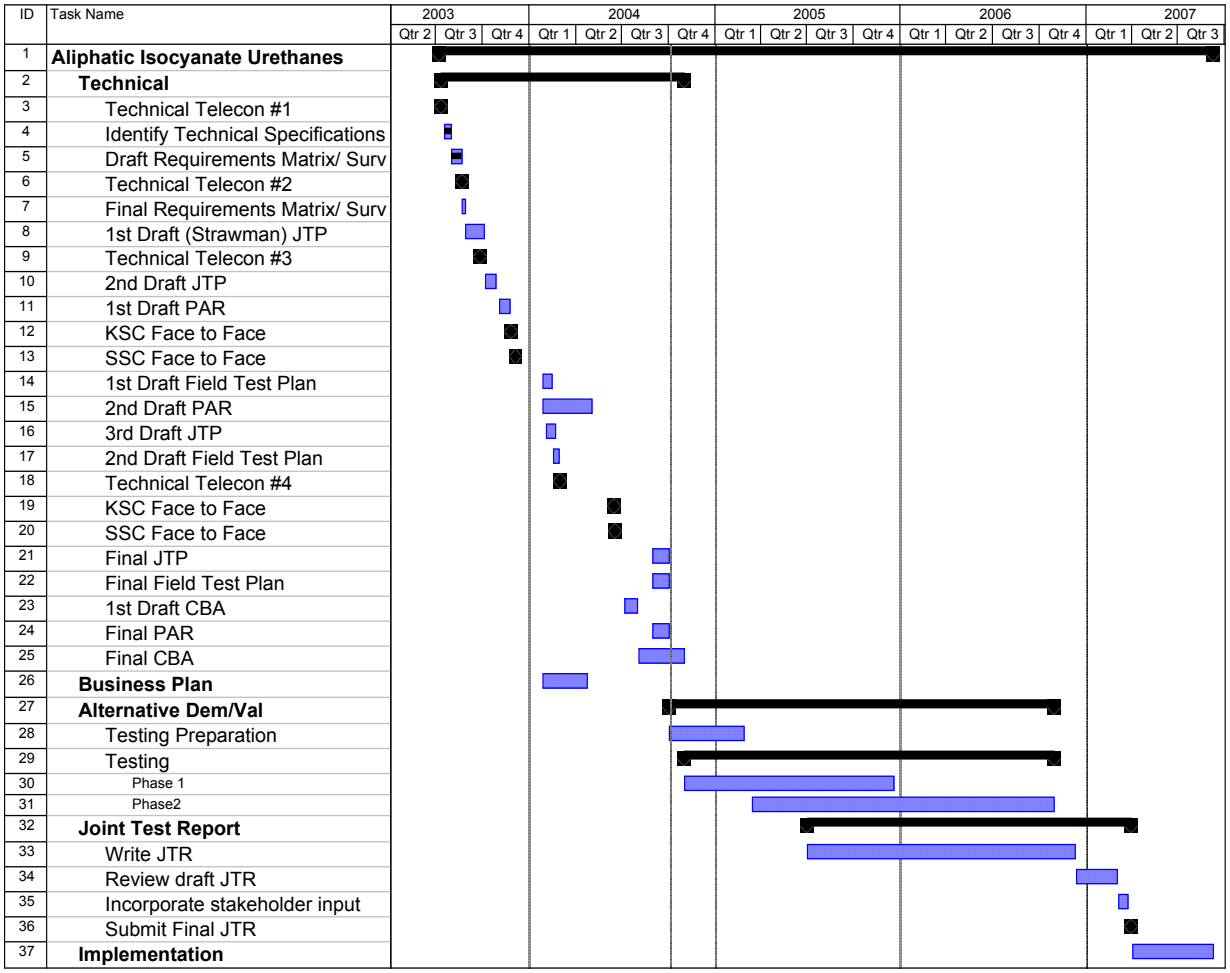
Next Steps

- Distribute final drafts of JTP and Field Test Plan for stakeholder comments/approval.
- Finalize ESOH and cost analyses of potential alternatives and identify which alternatives will undergo testing.
- Initiate lab and field testing of selected alternatives in accordance with the PAR and JTP
- Continue efforts to secure cradle to grave funding

Schedule

ITB maintains the project's schedule in Microsoft Project (Figure 3). The schedule was adjusted to account for delays in responses from stakeholders to review and provide comments on the Joint Test Protocol, Field Test Plan, and potential alternatives. The schedule was also changed to reflect the proposed test plan provided by ASRC, the contractor who is to perform the actual testing.

Figure 3 - Alternatives to Aliphatic Isocyanate Urethanes Project Schedule



b. Low Emission Depainting on Steel

Background/ Need
NASA's current use of abrasive blasting for surface preparation/depainting of structural steel create a fine, airborne dust. Such operations are regulated under OSHA, NIOSH, and ACGIH. An alternative technology that generates less dust is desired.

Objective
Validate a low-emission surface preparation/depainting technology for structural steel.

Stakeholders
Kennedy Space Center, Stennis Space Center, Air Force Space Command

Achievements
- JTP and Field Test Plan: Stakeholder comments of previous drafts are now being incorporated into the final drafts for distribution and final approval.
- PAR: Potential alternatives previously identified were further evaluated by the technical stakeholders. Based on this evaluation, several alternatives were removed from further consideration. More detailed Environmental, Safety, and Occupational Health (ESOH) and cost analyses of the remaining alternatives are currently underway and will be included in the final draft.
- Cradle to grave funding has been secured for this project from the NASA AP2 Program (supported by NASA HQ Environmental Division)

Problems Resolved
- The provision of NACE certified inspectors to support the inspection of field activities at Stennis has been resolved by incorporating this as a service provided by NASA's Corrosion Testbed Program

Current Problems
- Confirmation of preferred depainting alternatives for field and laboratory testing is still ongoing. The project team is currently reviewing stakeholder request to expand the project scope to embrace some new technologies and a wider field of application.

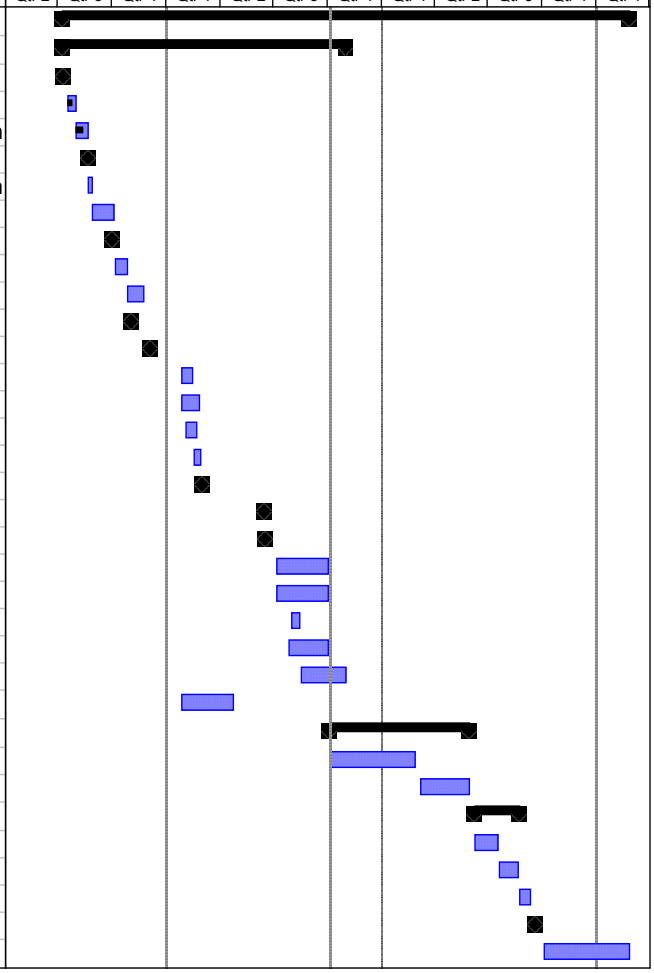
Travel
- No travel to report during this period.

Next Steps
- Distribute final drafts of JTP and Field Test Plan for stakeholder comments/approval.
- Finalize ESOH and cost analyses of potential alternatives and identify which alternatives will undergo testing.
- Initiate both the field and lab testing phases concurrently

Schedule
ITB maintains the project's schedule in Microsoft Project (Figure 4). The schedule was adjusted to account for delays in responses from stakeholders to review and provide comments on the Joint Test Protocol, Field Test Plan, and potential alternatives. The schedule was also changed to reflect the proposed test plan provided by ASRC, the contractor who is to perform the actual testing.

Figure 4 – Low Emission Depainting on Steel Project Schedule

ID	Task Name
1	**Surface preparation/depainting**
2	**Technical**
3	Technical Telecon #1
4	Identify Technical Specifications
5	Draft Requirements Matrix/ Survey Form
6	Technical Telecon #2
7	Final Requirements Matrix/ Survey Form
8	1st Draft (Strawman) JTP
9	Technical Telecon #3
10	2nd Draft JTP
11	1st Draft PAR
12	KSC Face to Face
13	SSC Face to Face
14	1st Draft Field Test Plan
15	2nd Draft PAR
16	3rd Draft JTP
17	2nd Draft Field Test Plan
18	Technical Telecon #4
19	KSC Face to Face
20	SSC Face to Face
21	Final JTP
22	Final Field Test Plan
23	1st Draft CBA
24	Final PAR
25	Final CBA
26	**Business Plan**
27	**Alternative Dem/Val**
28	Testing Preparation
29	Testing
30	**Joint Test Report**
31	Write JTR
32	Submit draft JTR for review
33	Incorporate stakeholder input
34	Submit Final copy of JTR
35	**Implementation**



c. Parts Washer Alternatives

Background/ Need

Parts washers currently used at some NASA Centers contain hazardous solvents and/or require the disposal of used cleaning fluids as hazardous waste. These solvent-based parts washers pose environmental, health and safety risks to NASA property and personnel.

Objective

Identify and test "green" parts washers that meet performance guidelines set by stakeholders. Perform a comparative analysis of current parts washers used at NASA facilities.

Additionally, due to proposed regulations, there is a need to highlight parts washers and parts washing fluids that have little to no HAPs and have a VOC content that is below 25g/L. Currently, 38 alternatives have been identified for shop-level testing, accounting for 17 companies which were down-selected from over 100 alternative cleaners and 28 companies.

Stakeholders

Multiple NASA Centers – Kennedy Space Center, Marshall Space Flight Center

(MSFC), Michoud Assembly Facility (MAF), Wallops Flight Facility (WFF), Glenn Research Center (GRC), Langley Research Center (LaRC), Jet Propulsion Laboratory (JPL), Stennis Space Center (SSC), White Sands Test Facility (WSTF), Goddard Space Flight Center (GSFC) and Ames Research Center (ARC). Initial demonstration of parts washers will occur at KSC, MSFC, MAF, WFF and GSFC.

Achievements

- Previously, a decision was made that four NASA Centers will be sites for testing. Goddard Space Flight Center both in VA and Wallops Flight Facility have offered space for the setup and demonstration of selected parts washers. Kennedy Space Center and Michoud Assembly Facility have agreed to test some alternatives as well. Additionally SSC, ARC and JSC are being considered for second-phase testing.
- Two Cleaning Efficiency test standards (MIL-PRF-29602A and ASTM-F-65) were distributed to the group for review in August. The standards were reviewed for acceptance by the group and there were no disagreements that some level of laboratory testing (as discussed in the standards) would be beneficial to the project, and if funding could be secured, it would be a welcome addition to the Consumer Guide. Currently the Rochester Institute of Technology, partnering with National Center for Remanufacturing Resource Recovery are reviewing a generic test plan and developing a cost estimate for testing alternatives to each standard.
- A form for use in obtaining operator impressions of the equipment during testing was developed and distributed to the group in May of 2004. The interview format and questions were approved by the group during the June teleconference. Some additions to the interview and questions were added in August of 2004.

Current Problems

- Vendors are collecting the standards data they used to create their materials specifications for MSDS sheets. Some vendors were unsure if their company or another independent source was responsible for this testing. The group will not include any self-tested materials unless the company agrees to have the materials independently tested prior to the end of this project.
- Prior to contacting vendors for materials donations, several Centers noted in returned data calls that they had possession of "moth-balled" parts washers that could possibly be used to house alternatives for testing. Upon identifying the test sites, it was discovered that the old parts washer units are in too great of disrepair and are more than likely un-useable for the purposes of this project. Currently the AP2 Office is identifying vendors that can loan parts washer equipment or rent it to each test site for the testing period (30-60days).

Travel

- No travel to report during this period.

Next Steps

- Arrange demonstration sites and products to be tested
- Ship materials and equipment to each site
- Arrange for interviews of shop owners and personnel and complete these interviews at 15, 30, 45, and 60 days (depending on length of testing)
- Determine if a standard method of testing parts washer fluid as a cleaner should be included in this study (Will be performed should funding permit)
- Author Parts Washer Alternatives Guidebook

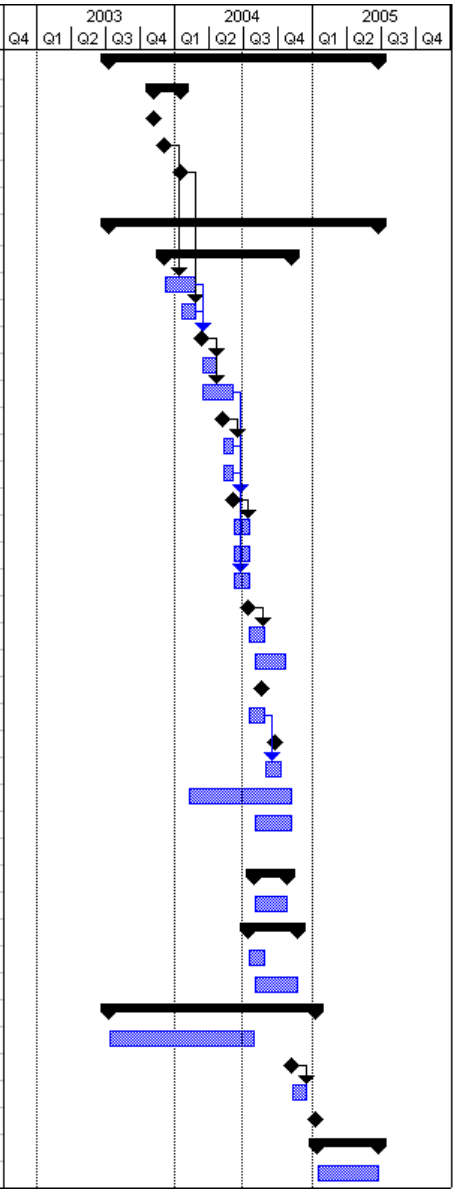
Schedule

ITB maintains the project's schedule in Microsoft Project (Figure 5).

Due to Hurricanes Francis, Ivan, and Jeanne in the August, 25 - September 27 timeframe, several teleconferences were cancelled and work was postponed on contacting vendors for delivery requests. This has caused a slight delay in the project schedule, but it is hoped that it will still allow for the publishing of the technical document before the end of January, 2005. This updated schedule reflects these changes.

Figure 5 – Parts Washer Alternatives Project Schedule

ID	Task Name
1	**Parts Washer Alternatives Project**
2	**Identification**
3	Project Telecon 1
4	Project Telecon 2
5	Project Telecon 3
6	
7	**Parts Washer Consumer Guide**
8	**Technical**
9	Identify Current Parts Washers
10	Performance Guidelines Draft #1 Review
11	Technical Telecon #1
12	Performance Standards Review
13	Identify Alternative Parts Washers
14	Technical Telecon #2
15	Performance Standards Review
16	Downselect Parts Washers Based on Standards
17	Technical Telecon #3
18	Develop - 1st Draft (Strawman) Consumer Guide
19	Select Demonstration Sites
20	Select Parts Washers and Cleaners for Demonstrations
21	Technical Telecon #4
22	Setup Parts Washers and Cleaners at Demonstration Sites
23	Begin Demonstration of Parts Washers
24	Technical Telecon #5
25	2nd Draft Consumer Guide
26	Technical Telecon #6 / Face to Face
27	**Final Consumer Guide (Prior to Testing)**
28	**Final Consumer Guide (After Testing Results)**
29	Cost Benefit Analysis A
30	
31	**Business**
32	Business Plan
33	**Alternative Dem/Val**
34	Testing Preparation
35	Testing
36	**Hands on Testing of Washers**
37	Write Consumer Guide and Test Protocols
38	Submit draft Consumer Guide (After Testing)
39	Incorporate stakeholder input
40	Submit Final copy of Consumer Guide
41	**Implementation**
42	Implementation



2. Developing NASA Projects

a. Membrane Removal of Volatile Organic Compounds (VOC)

Background/ Need

Throughout NASA locations, VOCs are generated during numerous manufacturing processes. These point source emissions are of great concern to some NASA Centers because of their location and ever increasing air emission regulations within such areas. Centers located in California are already very restricted in air emissions and other states are moving toward similar air regulations to reduce pollution within urban and suburban areas. Because of increased regulations, and the high cost that can be associated with process and/or materials change, there is an increased focus on developing technologies that can reduce VOCs without altering processes or materials within those processes. One of these technologies has been developed by the New Jersey Institute of Technology (NJIT) in coordination with Applied Membrane Technologies (AMT). The technology is a fiber membrane filter that is able to reduce the VOCs typically emitted in process lines by up to 98%.

NASA has worked with NJIT and AMT in the past, testing this technology at Kennedy Space Center. Tests results were very positive and the technology was able to eliminate over 97% of the VOCs from a paint booth emission stream and capture the solvents for re-use, recycling or disposal.

Objective

The objective of a future project with the NJIT/AMT Membrane technology is to further validate the technology within various environments where point source emissions of VOCs are encountered within NASA facilities. Such environments include paint booths, chemical laboratory hoods, chemical de-painting areas, solvent cleaning areas and pre-afterburner destruction of VOCs in order to reduce fuel costs. While membrane technology does not eliminate the use of high-VOC coatings, it can serve as an intermediate step toward the overall NASA goal of sustainability.

Potential Stakeholders

NASA Kennedy Space Center, Goddard Space Flight Center, Marshall Space Center, Michoud Assembly Facility, Wallops Flight Facility, Glenn Research Center, Langley Research Center, Jet Propulsion Laboratory, Stennis Space Center, White Sands Test Facility, and Ames Research Center.

Potential Benefits

- Ease of compliance with VOC emission regulations (especially for those facilities in non-attainment areas).
- Capture and recover nearly all solvents that are regularly emitted to the atmosphere.
- Environmental footprint of operation is reduced.
- Cost effective when compared to environmental air emission credits and other VOC filtering or treatment technologies.

Achievements

- NJIT's Dr. Sirkar presented the Membrane Technology at the International P2 Workshop in September. Dr. Sirkar agreed to work with the AP2 Office on future testing of the technology within NASA Facilities.
- Contacted KSC stakeholders for 2004/2005 demonstration/validation of VOC membrane technology within KSC.

Current Problems

- None

Travel
- No travel to report during this period.

Next Steps
- Solidify AMT's level of interest in a follow-up demonstration project.
- Begin development of a demonstration / validation project with JBOSC (KSC) and contact NASA's JSSWG to find if there are other NASA Centers or organizations interested in participating in a joint project.

b. NASA Follow-On to JG-PP Portable Laser Coating Removal System Project

Background/ Need
Several de-painting activities performed at KSC and other Centers are difficult to perform properly without damaging flight equipment in the process. Additionally to this, currently used de-painting technologies utilize hazardous chemicals and/or produce great volumes of hazardous waste that must be disposed of at a great cost to NASA. In an effort to identify user-friendly, low-hazard methods of accomplishing de-painting activities at the shop or depot level, the JG-PP identified lasers as a viable means to accomplishing these activities. Previously in the history of laser de-painting, the technology was not viable because of the size and design of laser systems. It was discovered that Europe had developed several types of portable, handheld laser units for use in monument re-surfacing and cleaning. These technologies were researched for use in DoD aircraft depots for paint removal in small area applications. NASA owns a variety of aircraft and also operates many pieces of ground service equipment that could benefit from a de-painting technology that is light, portable, produces little to no hazardous waste and requires little to no personal protection equipment while in use. Several NASA groups have shown interest in researching where these and other similar systems could be used in space-shuttle depot operations, aircraft depot operations, and ground service equipment operations.

Objective
The objective of this follow-on to the JG-PP PLCRS project would be to demonstrate one or more portable laser technologies for use in several areas within NASA. The first area would be space-shuttle operations, where current methods of paint removal have been found to cause damage and contamination in the surrounding thermal protection system when shuttle tiles are being replaced after flight. The second area would be to demonstrate the technology for use on NASA aircraft in depot operations (most of this has already been demonstrated during the JG-PP study) and lastly to demonstrate the technology for use in ground service equipment operations for space fight, non-space flight and facilities related equipment.

Potential Stakeholders
Multiple NASA Centers, especially Kennedy Space Center and Glenn Research Center, as well as the Coast Guard for marine applications.

Potential Benefits
- Reduction of hazardous waste streams in de-painting operations
- Reduction of risk to workers of exposure to hazardous paint strippers
- Reduction of time to prepare a tile cavity on the shuttle for a new tile
- Reduction of depot time for aircraft in small area de-painting and re-painting
- Reduction of risk to shuttle TPS system contamination and/or damage due to the use of wet-sanding and/or bead blasting

Achievements
- On August 9-11, a site-visit was held at Wright-Patterson AFB, Ohio to demonstrate the PLCRS technologies that have been tested under the JG-PP project. During this visit, representatives from two NASA Centers were present

to try some preliminary tests with their own samples. A total of 16 NASA representatives and 2 Coast Guard representatives were present for this two-day site visit. Preliminary testing went very well and KSC's laser-group is planning to submit for IES Funding for a project that tests laser and liquid nitrogen technologies against standard de-painting technologies in a variety of applications. GRC is also very interested in being a partner to this project.

- A follow-up meeting to the site-visit was held at OPF-3 at KSC on September 21, 2004. Members of the KSC laser team are working on their presentation for funding to IES. The NASA AP2 Office has offered to author any PAR, JTP, or other technical documents required for the project as well as oversee the project and help coordinate the joint-efforts between NASA Centers interested in such technologies.
- Arranged for presentation on PLCRS at NASA's International Pollution Prevention Workshop in September 2004.

Problems Resolved

- Due to Hurricanes Francis, Ivan and Jeanne, the initial follow-up meeting was cancelled and re-scheduled for September 21, 2004. Because of the change in schedule, representatives from GRC were not able to dial-in to the meeting. Mr. Rothgeb is maintaining contact with GRC and sending them updates as required.

Current Problems

- None

Travel

- August 9-11 - Wright-Patterson Air Force Base, Ohio (Rothgeb)

Next Steps

- Work with USA for FY 05 IES Funding and determine the scope of the project(s). May start initial testing in FY 04 with AP2 Dem/Val Funding.
- Work with GRC and KSC to develop the PAR and JTP for the project. Work with KSC and help in submission for funding to IES as requested.
- Develop a test-plan that can account for FY2004 funding and begin early developmental testing of laser units and liquid nitrogen stripping technology.
- Contact other NASA Centers and determine if others would be interested in participating in this project.

c. Coatings and Linings Project

At the September C3P/NASA International P2 Workshop, ITB facilitated discussions between technical representatives from NASA, Air Force Space Command Range and Space Lift Operations, and Air Force Weapon System Maintenance on a potential project to test and qualify Kimetsan D45-AMS coating system for facilities and shuttle operations.

It is currently envisaged that the project team shall comprise of members of the following entities (these individuals are currently working to scope the project as per the material performance requirements of their respective systems)

- KSC Shuttle Program (PH) – Facilities
- Stennis Space Center Facilities and Maintenance
- Patrick AFB Facilities and Maintenance
- 45 Space Wing Pollution Prevention Program
- Vandenberg AFB Facilities and Maintenance
- AFSPC Pollution Prevention Program

- Hill Air Force Base
- Malmstrom Air Force Base
- NASA Acquisition Pollution Prevention Program (project coordination)

3. Supported NASA Projects (SEA)

ITB participated in teleconferences and face-to-face meetings of the Shuttle Environmental Assurance (SEA) initiative. ITB's support involved:

- Responding to SEA action items and other specific requests for information.
  - ITB reviewed and commented on the External Tank (ET)/Lockheed Martin (LM) collaborative study reports on Replacements for Hexavalent Chromium Primers and Replacements for Cadmium in Plating Applications.
- Offering technical knowledge relevant to SEA activities and studies for P2 project development in technical areas such as:
  - Alternatives to chromate conversion coatings.
  - Alternatives to chromate primers.
  - NASA usage and alternatives to tin-lead solders for electronics.
  - Regulations surrounding brominated flame retardants.

As just one example of ITB's proactive support to SEA in 2004: Ms. Lewis conducted a survey of outside agency work in cadmium alternatives to identify viable alternatives for testing in the SEA's collaborative studies. This information may greatly reduce the time and effort required to identify potential alternatives through extensive technology and vendor surveys.

4. Other NASA Program Development and Support

Proposed NASA Corrosion Prevention Advisory Board

No activity this reporting period.

NASA Technology Center for a Sustainable Future

Previously, AP2 staff reviewed and began organizing a document in response to a NASA Request for Proposal for a NASA Technology Center for a Sustainable Future. The original due date for a proposal was July 15, but this has now been changed to "TBD". ITB writing stopped shortly thereafter pending a determination of the level of interest that other Centers may have in partnering with the AP2 program on sustainability matters.

C. DOD Business Entity Support

ITB's objective for the Department of Defense (DoD) business entity is to leverage resources with the DoD, primarily the Joint Group on Pollution Prevention (JG-PP) and Air Force Space Command, to maintain environmental technology cooperation and qualify shared alternative material and process solutions that are less or non-hazardous to the environment.

DoD support activities can be categorized as follows:

1. JG-PP Working Group (WG)/program support
2. Identify P2 needs and develop DoD projects
3. Manage, support and monitor active JG-PP projects

Achievements and highlights under each of the three categories are discussed below.

1. JG-PP Working Group (WG) Program Support

ITB regularly supported the JG-PP WG through participation in teleconferences, business, and technical meetings; JG-PP Principals' Meetings; and Joint Logistics Commanders (JLC) Meetings. ITB personnel have a wealth of experience and knowledge of JG-PP operations. This support contributed to JG-PP's continued success and drive for continuous improvement.

Primary WG efforts supported by ITB included reviewing and commenting on the JLC briefs for fall 2004 briefing of the JG-PP Principals and JLC members, conference planning (including booth upgrades), and continual improvements to JG-PP's operating procedures and strategic approach to carrying out the JG-PP mission.

Following are examples of the JG-PP WG support provided as a result of WG meetings held during this reporting period.

Following the July 6, 2004 WG meeting -

- Prepared a white paper on the benefits of JG-PP getting involved in acquisition and internationally
- Reviewed and submitted comments on the JLC's Charter for JG-PP
- Reviewed and provided comments on JG-PP's proposed flyer to replace the current tri-folds

Following the July 20, 2004 WG teleconference -

- Updated and revised NASA Supported Projects for CTC
- Prepared and submitted a draft PowerPoint presentation of the SOLE 2004 Annual Conference in Norfolk, VA
- Provided CTC suggested comments to the Project Matrix
- Provided suggested responses to questions on the DLA Request for Project Information

Following the August 3, 2004 WG teleconference -

- Reviewed and provided comment on the draft JG-PP briefing charts to the JLC
- Prepared and submitted draft paper for the SOLE 2004 Annual Conference

Following the August 31, 2004 WG teleconference -

- Provided NASA's principal's biography to CTC for inclusion in the JLC briefs

Following the September 14, 2004 WG teleconference -

- Provided comments on the latest revision to the JLC briefs
- Suggested financial de-obligated funds be explained in a brief summary for the JG-PP WG

Following the September 28, 2004 WG teleconference -

- Prepared and submitted a draft JG-PP WG 5-year plan
- Reviewed and commented on CTC's proposed plan for upgrading booth displays on the JG-PP secure Web site.
- Reviewed and commented on CTC's proposed marketing script for use by JG-PP booth attendees on the JG-PP secure Web site
- Reviewed and commented on CTC's proposed schedule of booth exhibitions on the JG-PP secure Web site
- Provided CTC approval to use NASA's suggested Project Matrix changes to distribute to the WG
- Provided CTC a draft proposed Core Strategic Plan for JG-PP

Pending JG-PP WG Action items, as of September 30, 2004:

- Submit SOLE trip report and recommendations to the JG-PP WG

Travel

- B. Greene traveled to the SOLE conference in late August 2004 early September to deliver a presentation and paper on JG-PP & Lead-Free Solder.

2. Identify P2 Needs and Develop DoD Projects

ITB served as NASA liaison on the following efforts undertaken by JG-PP. The intent of these JG-PP efforts is to define the objective and scope of one or more new JG-PP P2 projects.

a. JG-PP Solvent Substitution Database

Objective

Develop and implement a Joint Service Solvent Tracking (JSST) database that will serve as a comprehensive site designed to provide information on completed, ongoing, and proposed solvent substitution efforts throughout the DoD and NASA. The intent of the solvent tracking database is to provide solvent substitution information on DoD and NASA processes and solvents so data can be leveraged and prevent the duplication of efforts.

Achievements

- None to report (see "Problems" below)

Problems Resolved

- None to report

Current Problems

- From a NASA perspective, ITB is unsure how useful the JSST Database

will be to AP2 and NASA, at least in terms of developing any dem/val projects that NASA would benefit from. To date, NASA contractors have solved many priority handwipe issues. It is possible that much of the information being entered into the Database will not benefit NASA's current operations. NASA's role might end up being migration of NASA solutions to the DoD and/or monitoring of DoD progress.

- It may be possible to team with the JSSWG and determine if the migration of the AP2 ITDb and the JSSWG database would be of benefit to the JG-PP. This has yet to be determined as the final version of the database is not yet fully tested.

Travel

- No travel during this period.

Next Steps

- Each service and NASA to identify who, if anyone, from their agency will approve and enter solvent substitution data into the JSST Database.
- Full implementation of the database is currently being performed.
- Add any solvent substitution data to the database (NASA hand-wiping projects, experiences, etc.)

b. Coatings Project Development

Background/ Need

JG-PP prepared a list of the top 1-n pollution prevention needs of the joint services and NASA. This list was compiled, sorted, and ranked in priority order. One of the top project thrust areas was in the coatings area.

Objective

To identify new coating project opportunities, evaluate them, and to make recommendations to the WG.

Achievements

- A review of the Strategic Environmental Research & Development Program's (SERDP) Coating/Decoating Workshop briefings held May 25-27, 2004, was performed. Three potential JG-PP project areas were identified:
  - Non-Chromate Primers
  - Specialty Coatings
  - Powder Coatings
- The SERDP Coating/Decoating Workshop minutes are not yet available. It was decided that moving forward with identifying coating project opportunities without the minutes is a risk; therefore, the committee agreed to halt any further action until the minutes are released.
- A document representing the Navy's coating project areas of interest was distributed for review.
  - Ms. Lewis is reviewing the document and preparing a response including NASA's areas of interest.

Problems Resolved

- None to report

Current Problems

- The group is still waiting to obtain the SERDP Coating/Decoating Workshop minutes before continuing with actual identification of projects to recommend to the JG-PP WG.

Travel
- No travel to report during this period.

c. Chemical Spill Sensor Project Development

Background/ Need
A need exists with all HAZMAT storage to detect and stop releases as soon as possible. This will reduce and limit the amount of hazardous materials released to the environment if detected. Early leak detection may avert a major spill or release of hazardous material. Better detection can also enable a safer response by workers or emergency personnel if they are aware of the hazard.

Objective
To develop a real time sensor to detect hazardous material leaks or spills when they occur. The sensor system will be able to notify proper personnel or authorities at the time of detection, and provide hazardous material information on the type of hazard, exposure and safety issues for responding workers or emergency response personnel.

Achievements
- Potential new project, in program development.

Problems Resolved
- None to report

Current Problems
- None to report

Travel
- Possible travel to Dryden Flight Research Center (DFRC), Edwards AFB to help scope potential project and outline a draft ESTCP proposal. John Herrington and possibly Patti Lewis.

Next Step
- Evaluate project information papers and discuss our possible involvement with Ms. Christina Brown. Possibly set up a teleconference with personnel at DFRC.

3. Manage, Support and Monitor Active DoD Projects

As with Agency P2 projects, DoD projects may be categorized as either managed or supported projects. With the exception of the JCAA/JG-PP Lead-Free Solder project (which was managed by the AP2 Office), all other JG-PP projects were supported projects from NASA's perspective. Of these, the JG-PP supported projects of most NASA AP2 involvement and interest during the reporting period were the Portable Laser Coating Removal System project and the Solvent Substitution project development effort. On these efforts, ITB acted as the liaison to assure that NASA requirements were being incorporated.

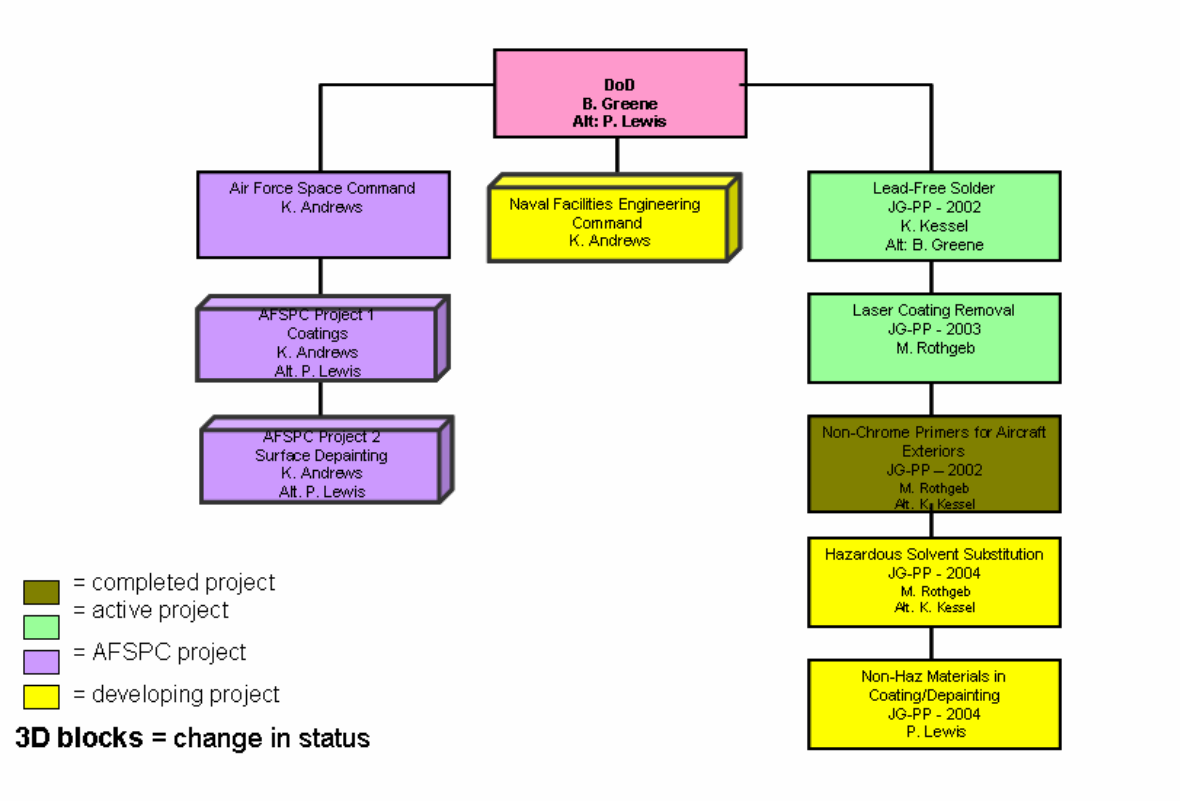
Due to a number of JG-PP project closures and lack of proactive JG-PP communication on the remaining active projects, ITB engineers only spent minimal time monitoring other JG-PP projects and instead focused efforts on possible partnership opportunities with non JG-PP entities, such as Air Force Space Command (AFSPC).

One identified effort is a proposal by AFSPC to test a prototype Fiber Optic Hydrazine

Detection and Reporting System (FOHDARS). The system is designed to monitor hydrazine vapors at even a few parts per billion (ppb) in air and report these levels to a central control facility. If effective, the system will minimize the release of a hazardous material and improve personnel protection. ITB is in contact with various centers that store hydrazine to determine NASA interest in this project.

Figure 6 depicts the ITB engineering assignments to those DOD projects that are completed, active or under development.

FIGURE 6 - DoD Business Entity Project Opportunities and ITB POCs



The following sections provide an overview of ITB's activities for those DoD projects of most significance.

4. Active DoD-NASA Projects

a. JCAA/JG-PP Lead-Free Solder Project

Background/ Need

Consumer electronics are driving the commercial market to be "green", i.e. use lead-free alternatives. However, lead-free reliability in Class 3 (high performance) environments is unknown.

Objective

A joint DoD-NASA-OEM project was formulated to provide baseline data to allow eventual qualification and validation of lead-free solder alloys for use in manufacture and repair of electronic equipment.

Stakeholders

- NASA KSC, JPL, MSFC, JSC, GSFC, Ames Research Center (ARC),
- United Space Alliance – Solid Rocket Booster (USA-SRB), Boeing-Orbiter
- Air Force, Army, Navy, Marines, Dept. of Energy
- More than 25 manufactures and vendors
- Several new points of contact from Harris Corporation have been added to the LFS consortium
- Day-to-day management of project is executed by ITB

Task Order #3 Requirements

Because of some inherent overlap of discussion topics between ITB task orders, ITB is hereby reporting significant Task Order #3 activities under this Task Order #6 quarterly status report. Task Order #3 relates to the procurement and selected testing and evaluation of lead-free solders. In short, all testing materials needed for the Lead-Free Solder project are being purchased under Task Order #3, as well as the services to conduct mechanical shock testing and lead-free residue analysis.

Achievements

- All testing facilities (being paid to execute testing) are currently under contract and have received their allotment of test vehicles. Test vehicles were shipped beginning July 1 and ending July 22, 2004.
- A table was developed, by Ms. Lety Campuzano-Contreras (BAE Irving Texas) and Mr. Kurt Kessel (ITB, Inc.), to track which test vehicles, by serial number, were shipped to each testing location. Problems that arose during assembly and rework procedures, which resulted in test vehicles being rendered unusable and having to be replaced were noted as part of the table.
- Boeing Phantom Works, Seattle Washington, started Vibration Testing in early September. All “manufactured” and “rework” test vehicles have been tested. Data needs to be reduced and put into a useable format.
- Boeing Phantom Works, Seattle Washington, started Thermal Shock Testing on July 24, 2004. Thermal shock testing will be run in 4 lots and testing is expected to be completed late December 2004.
- Boeing Phantom Works, Seattle Washington, is planning to start the Thermal Cycle Testing -20 to +80^{o}C on September 25, 2004. Testing is expected to run through the spring of 2006.
- Rockwell Collins, Cedar Rapids Iowa, started Thermal Cycle Testing -55 to +125^{o}C the week of September 20, 2004. Testing is expected to run through summer 2005.
- ACI has completed the Salt Atmosphere Testing September 2004.
- ACI is planning to start the Temperature Humidity Testing October 2004.
- ACI, sub-contracting to BAE, is planning to start the Mechanical Shock Testing in October 2004 and should be completed before the end of 2004.
- Raytheon, Dallas Texas, is planning to start the Combined Environments Testing October 2004 and the testing should be completed by the end of November 2004.
- Partial funding ($50K) for the Combined Environments Test (CET) was obtained from BAE. Raytheon, Dallas Texas (testing location that will perform the CET), has agreed to contribute the remainder of the funds required to complete the CET as in-kind contribution (although not enough funds for thorough data analysis and reporting). An additional $60K in funding, from Aging Aircraft, is currently being processed by GSA. The funding is required in order to complete the data analysis and report writing.

Problems Resolved

- Project change in scope for the Mechanical Shock Test. The original test plan was updated to reflect new testing procedures, based on inputs from Boeing and

JPL. A new mechanical shock profile was developed by ACI, Boeing and JPL. As a result of the change in scope a cost increase of approximately $20K was incurred and paid for by NASA.

- Due to issues (outlined below) that arose during the assembly of the initial test vehicles a phase-1b test plan is being planned to obtain data from the CSP and Hybrid components.
- CSP: The wrong component was shipped. The component measures .8mm from the center of each ball to the center of the next ball while the board placement measures .7mm
- Hybrid: The hybrid component is designed to be put on a circuit board with a recessed area for the hybrid, which allows the leads to meet the circuit board pads. The assembled circuit boards being used on the lead-free solder project are not recessed for the hybrids. The consortium has agreed to test the CSP and Hybrid components under two testing conditions, vibration and thermal cycle -55 to +125^{o}C as outlined in the current JTP. Funding for the initial steps of the phase-1b test plan has been outlined below.
- The following contributions were obtained (orally) for the upcoming CSP and hybrids testing:
  - The test boards will be purchased by Rockwell Collins with NASA funding. Approximately $10K will be provided by NASA to procure the new test boards.
  - BAE Irving Texas has agreed to build the test vehicles as in-kind contribution. The assembly has been estimated at approximately $30K.

Current Problems

- Funding has been obtained (from BAE and Raytheon) to complete the Combined Environments Test. Their contribution only covers the core testing and is not enough funds for thorough data analysis and reporting. An additional $60K in funding is to be provided by Aging Aircraft so that the data analysis and reporting can be completed. Currently there has been a delay in transferring the funding from Aging Aircraft to Raytheon. The funding is being processed by GSA and the necessary paperwork has become mired on someone's desk. The issue is being worked by the ITB, Inc. Northern office. All testing procedures to be carried out by Raytheon will continue as planned. Following the completion of the testing, all data will be kept by Raytheon until funding is released and the data analysis and reporting can be completed.
- Funding for Phase-1b (CSP and hybrids) testing has not been obtained as yet. The ITB, Inc. North office is working with Aging Aircraft to procure the appropriate funding (approximately $130K) so the vibration and thermal cycle -55 to +125^{o}C testing can be completed for the phase-1b test plan.

Meetings

- September 21 LFS Project Meeting hosted by Harris Corporation, Melbourne Florida.

Travel

Project Integrator Kurt Kessel visited the project's three major testing locations to audit and document their set-up and procedures.

- July 1, 2004: Site visit to Rockwell Collins to view set up for Thermal Cycling, Cedar Rapids, IA. (K. Kessel)
- August 5, 2004: Site visit to Boeing Phantom Works, Seattle Washington to view the set up for the Vibration Test, Thermal Shock Test and Thermal Cycle Test -20 to +80^{o}C. (K. Kessel)
- August 9, 2004: JCAA Lead-Free Solder Business Meeting to better define the business plan, including funding sources for testing activities; WPAFB, OH (K. Kessel)

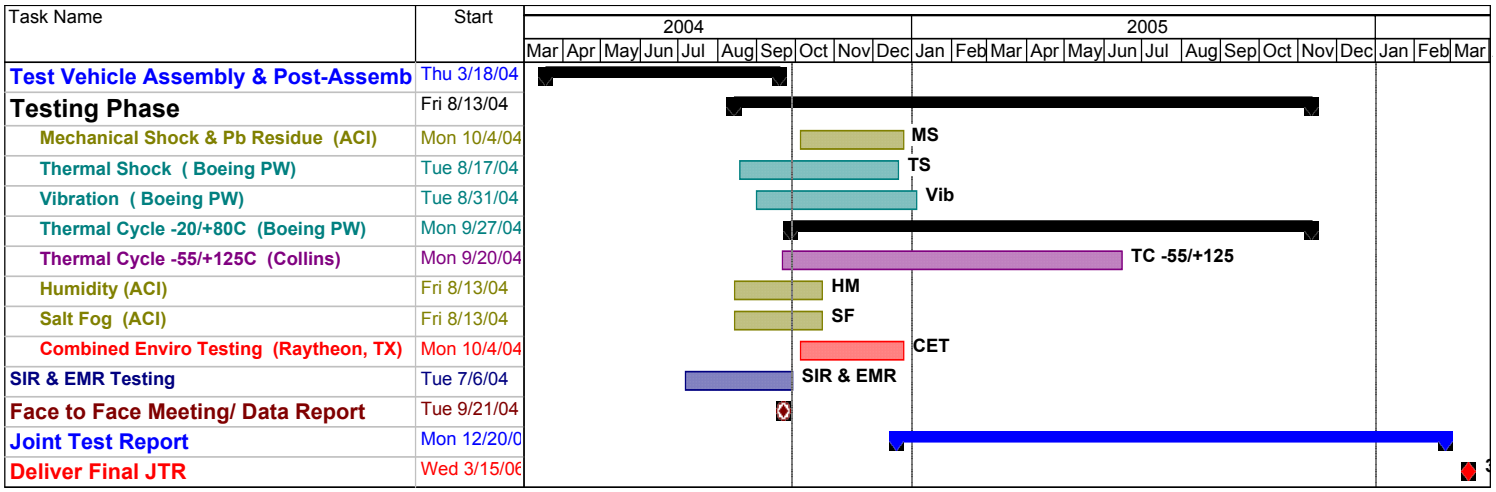
Next Steps

- Organize and facilitate next technical teleconference in December 2004 via Web-based conferencing (WebEx)
- Plan next face-to-face technical meeting in April 2005 in Anaheim, CA to discuss testing results
- Work with ITB, Inc. north office to obtain funding for the Phase-1b vibration and thermal cycle -55 to +125°C testing
- Begin obtaining and consolidating test results, and begin drafting the JTR

Schedule

ITB maintains the project's schedule in Microsoft Project (Figure 7). ITB is forecasting no changes in project completion dates.

FIGURE 7 - JCAA/JG-PP Lead-Free Solder Project Schedule



a. JG-PP Portable Laser Coating Removal Systems (PLCRS) Project

Objective

Develop and test portable laser systems as an alternative to chemical and/or physical hand-stripping of small parts.

Achievements

- Three laser systems are being tested. Finished all strip cycles for all panels being tested as of August, 2004.
- Panels are currently undergoing mechanical and other laboratory testing. All testing should be complete and initial data available by December, 2004.
- Of the three laser systems, two systems may be of future interest to NASA:
  - "Clean-laser" (ND-YAG) – for paint removal from composite and aluminum surfaces between space flights
  - Quantel (ND-YAG) laser – replacement for glove-box paint removal from complex geometries.

Problems Resolved

- AP2 staff identified stakeholders within KSC and GRC. Previously, no stakeholders within NASA had shown much interest in the project. A follow on to the JG-PP project, leveraging from that project, is currently being considered for late 2004, early 2005.

Current Problems

- It is a distinct possibility that NASA's standards applicable to our stakeholder's areas of interest concerning the laser technologies may not be included in current testing procedures.
- When final test results are completed, NASA will review the results to determine if future testing for parallel applications will be necessary.
- Follow-On Testing is already planned for Shuttle and GSE depainting applications and is being developed for a FY04-FY05 project.

Travel

- August 9-11 - Wright-Patterson AFB, Ohio (Rothgeb).
- Reviewed most current JG-PP PLCRS data and demonstrated the technology for two NASA Centers and members of the Coast Guard.

Next Steps

- Continue to gain support from NASA contractors who may consider demonstrating and possibly implementing PLCRS.
- Work with interested NASA Centers to leverage as much information from the JG-PP project and move forward with a follow-on to the PLCRS project involving NASA-specific needs.

Monitored DoD Projects/Technologies

ITB gathered information on a number of manufacturing and maintenance P2 projects and technologies while attending conferences, workshops, and meetings. Developments, personnel contacts, and conclusions of importance are included in the corresponding trip reports (see Appendix A).

D. International Business Entity Support

ITB's overall objective for the international business entity is to support the Portuguese Institute of Environment and Centro Para Prevenção da Poluição – C3P (English translation: Center for Pollution Prevention) under the NASA/Portugal Joint Statement (JS) and the Terms of Reference (TOR). C3P is the AP2 counterpart organization in Portugal.

The international support activities in the past year can be generally categorized as follows:

1. C3P program development and support
2. Identify P2 needs and develop projects
3. Train C3P engineer
4. Support and monitor active C3P projects

Achievements and highlights under each of the four categories are discussed below.

1. C3P Program Development and Support

International P2 Workshop

ITB, under the directive of NASA HQ Environmental division, hosted the C3P Joint Oversight Group (JOG) meeting and NASA/C3P International P2 Workshop, on September 21 and September 22-23, respectively in Florida. The JOG provided a forum to discuss at the executive level the 2004 accomplishments of C3P as well as the strategic goals for 2005. The two-day workshop provided up-to-date information on solutions and lessons learned on joint P2 projects, as well as visual demonstrations of P2 solutions at Kennedy Space Center. Breakout sessions during the workshop provided the opportunity for quorums to discuss new technologies and formulate project strategies for operation in both the domestic and international arena. The workshop targeted materials and process engineers from the United States, Europe, and elsewhere affiliated with government agencies as well as large and small businesses enterprises (SME's). ITB engineers and staffers provided significant technical, logistic and administrative support to both the JOG and workshop of an exemplary quality. Examples of activities include

- Prepared a U.S. and international distribution list.
- Advertised the workshop through e-mail and the AP2 Website
- Developed from scratch a two-day technical program consisting of expert speakers in a variety of P2 areas, supplemented with technology tours at KSC and CCAFS.
- Handled JOG and workshop administrative and logistical matters, such as:
    - Online registration (167 registered)
    - Confirming meeting space and lodging rooms at the Radisson
    - Assisted and coordinated the International P2 Workshop graphics display, posters, tri-folds, tour tickets, audio visual equipment, and name tags.
    - Updated and created documents for KSC security badging and tour transportation
    - Assembled meeting packets and gifts for each speaker and VIP JOG participants
    - Coordinated catering for JOG and International P2 Workshop
- Coordinated adjunct project meetings, such as the Lead-Free Solder project team meeting at Harris Corp. (Melbourne, FL) the day prior to the workshop.
- Created a post workshop web page to contain PowerPoint presentations from the workshop.

Joint Oversight Group Meeting

ITB coordinated with NASA (David Amidei, Christina Brown) and C3P (General Branco) in planning and hosting a C3P JOG meeting on September 21, 2004 at the Beach house at KSC, in accordance with the requirements of the JS/TOR. The meeting was attended by representatives from C3P, NASA HQ (Olga Dominguez, James Leatherwood, David Amidei), NASA KSC (Jim Kennedy, Jeanne Hawkins), NASA AP2, and the European Space Agency (ESA).

As was stipulated by the C3P JOG, ITB engineers completed project briefs on five pollution prevention areas that are of possible interest at the Portuguese national and European level. These documents were duly submitted to the C3P executive on September 29. The subject topics are as follows

1. Validation of suitable alternatives to hexavalent chrome (Cr+6) in conversion coatings and primer coatings for aluminum substrates
2. Identification, demonstration and validation of alternatives to high volatile organic compound (VOC) primers and topcoats containing methyl ethyl ketone, toluene, and xylene
3. Demonstration of innovative VOC emission control technology for use in industrial applications
4. Validation of alternatives to lead-containing dry film lubricants for antigalling/antifretting, antiseizing, and assembly aid applications
5. Validation of suitable low-VOC and HazMat free technologies for depainting on aluminum and composite substrates

Following are some of the key programmatic highlights and outcomes from the JOG and workshop:

- General Branco reported at the JOG meeting that three institutions have agreed to sign an Exchanged Protocol to partner with C3P:
  - The Welding Institute UK (TWI)
  - The Spanish Innovation and Technical Development Foundation (INASMET)
  - The Portuguese Air Force.
- Press releases showing the good work that Portugal is promoting through C3P will be prepared for American Ambassador in Portugal and the Portuguese Environment Ministry.
- In total, 115 individuals from six countries (United States, Portugal, United Kingdom, Turkey, Canada, and The Netherlands) attended the International P2 Workshop. Thirty experts presented PowerPoint slides. Feedback from the attendees indicated the workshop was a success, and that they would attend again.
- As a direct result of the P2 Workshop, the NASA AP2 Program office will be following up on a number of potential opportunities for further collaboration, including:
  - Interest from KSC (JBOSC), Wallops, & C3P on a project opportunity to evaluate membrane technology for removing VOCs from process air streams
  - European Space Agency interest in an information exchange on nonchrome pretreatments
  - Lead-free solder test information exchange between NASA AP2, C3P and Hereaus, an international solder manufacturer
  - Proposal from BAE Systems (New York) to consider jointly develop a draft standard to show parts manufacturers how to mark parts lead-free in a common manner
  - U.S. Lead-Free Solder stakeholder interest in idea of a lead-free solder summit with a major Navy electronics program in 2005
  - Tentative and confirmed in-kind contributions for follow-on work to the JCAA/JG-PP Lead-Free Solder project, namely:
    - BAE Systems, Irving, TX – Will provide in-kind work to assemble test boards for CSP and hybrids testing in 2005.

- Rockwell Collins, Cedar Rapids, IA - Technical representative is to approach company management with ITB's information on future lead-free solder project ideas and seek 2005 in-kind contributions.

- Interest from U.S. Air Force Space Command, Hill AFB, Patrick AFB, and NASA in a possible coatings system project.

2. Identify P2 Needs and Develop International Projects

Working with OGMA and TAP, ITB previously identified six (6) candidate EU/Portuguese P2 projects (Table 6), of these; ITB engineers recommended four projects for kickoff by C3P in 2004, and two in 2005. Projects identified were selected based on their importance to the stakeholders and the relative maturity of the alternative technologies or materials. Due to resource restrictions, it has been identified that C3P through the guidance of the NASA AP2 Program and its ITB Engineers would first address the replacement of Alodine 1200 in spray and dip applications. Level of effort and accomplishments of this project would then be reviewed to evaluate the viability of addresses more than one P2 need at a time by the joint C3P, TAP, and OGMA team. Subsequent to the July meetings in Portugal and the significant and commendable accomplishments at meetings parallel to the workshop in September (Florida), it was decided by the C3P TAP/OGMA project that they should initiate some efforts towards the replacement of high VOC coatings for aircraft painting and in general painting scheme (C3P.Proj.VOC.Port.001) project in the latter part of 2004 and certainly 2005.

Table 6 – 2004 Candidate EU/Portuguese P2 Projects

No.	Project ID	Description
1	C3P.Proj.CCC.Port.001	Identification of suitable alternatives to hexavalent chrome (Cr+6) in conversion coating Alodine 1200 on AL 2024, 7075, and 6061.
2	C3P.Proj.NCS.Port.001	Dem/Val of Non-Chrome sealants for the fuselage and other metal to metal panel joints
3	C3P.Proj.VOC.Port.001	Replacement of high VOC coatings for aircraft painting and in general painting scheme.
4	C3P.Proj.TCE.Port.001	Trichloroethylene (TCE) replacement in dip tank cleaning and degreasing operations. It is regulatory requirement that TCE use cease in 2007.
5	C3P.Proj.CPC.Port.001	Dem/Val of suitable alternatives to hexavalent chrome (Cr+6) in primer coatings (AL 2024, 7075, 6061).
6	C3P.Proj.CEC.Port.001	Dem/Val of alternatives to Chrome and Cadmium plating on fasteners and engine components; landing gear, turbine fans, etc.

3. Train C3P Engineer

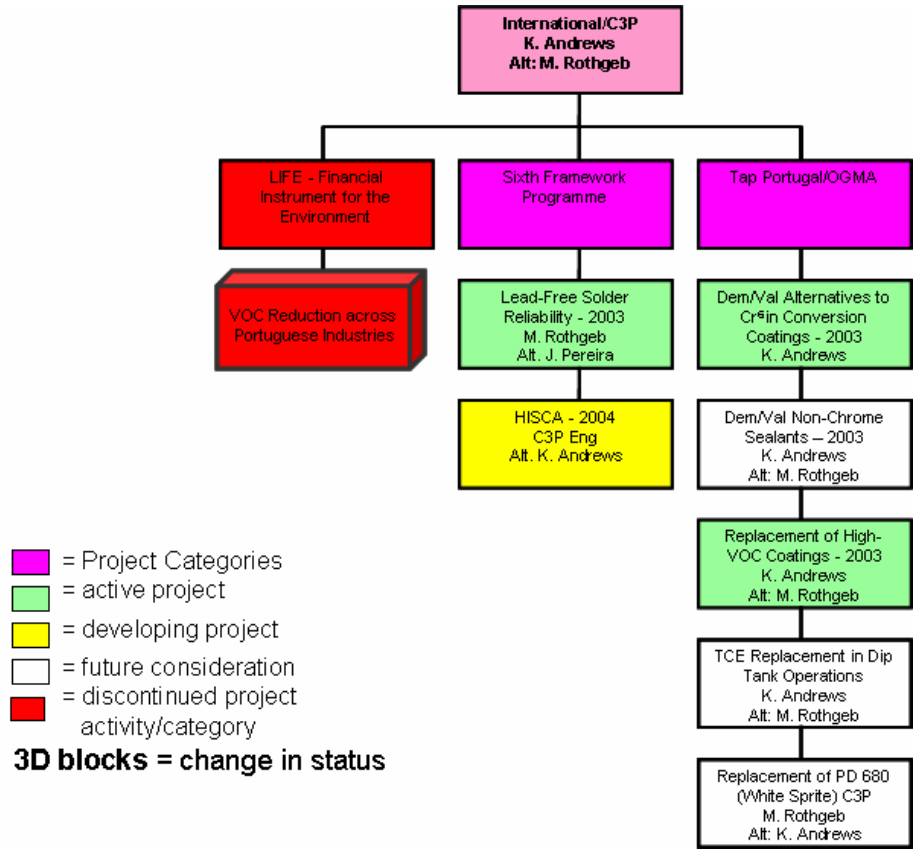
Ms. Pereira will be assisting the C3P with ongoing projects. Ms. Pereira worked with Mr. Rothgeb and Mr. Andrews on the JTP and PAR for a C3P project concerning the replacement of Alodine 1200 in aerospace applications.

Mrs. Pereira is now an instrumental member in the effort to maintain project momentum in Portugal and is currently working with the TAP/OGMA team under the guidance of ITB Eng. K. Andrews in support of field application and flight-testing of alternative coating systems in Portugal

4. Support and Monitor Active C3P Projects

Figure 8 depicts the ITB engineering assignments to those international projects that are active or under development, along with other ideas for future project consideration.

FIGURE 8 - International Business Entity Project Opportunities and POCs



The following sections provide further discussion on ITB's activities in international project development.

a. TAP-OGMA Projects

1. Identification of Suitable Alternatives to Hexavalent Chrome (Cr+6) in Conversion Coating Alodine 1200 on AL 2024, 7075, and 6061

Objective
Test and implement alternatives to conversion coating Alodine 1200 in aircraft processing operations at TAP-Air Portugal and the Oficinas Gerais de Material Aeronáutico (OGMA).

Achievements

- Both Andrews and Lewis reviewed the JTP and PAR submitted by Rothgeb and Periera and made the appropriate editorial and technical amendments before disseminating this as a first draft to TAP and OGMA.
- ITB Eng. Kevin Andrews completed the first draft of the C3P TAP/OGMA Field Test Plan regarding replacement of hexavalent chrome conversion coatings by

TAP and OGMA in both spray and dip applications. This has been submitted to the project team for review and comment.

- Arrangements are currently being made towards the goal of applying alternative coating systems on substrates in November 2004 (now scheduled to begin in late Oct.). Along with the engineers at TAP (and OGMA), C3P intends support the flight-testing of both a low-voc and non-chrome painting scheme on a commercial aircraft.

Underlining the benefit and importance of our joint approach, the current procedure calls for the application of the above mentioned painting schemes to a TAP commercial aircraft at the OGMA facility by OGMA and TAP personnel under C3P supervision.

The following approach is planned:

Aircraft type: Air Bus A319
MSN: 1100
Reg. No: CS-TTL
Old Painting scheme process removal: Stripping
'C' checks planning: **16 Oct to 5 Nov, 2004**

The basic painting scheme will be Aviox with a slight difference in one side of the A/C. This is:

A/C LH side - ***High Solids*** **AKZO NOBEL Painting Scheme:**
M790E for surface preparation
Aviox CF Primer
Aviox Finish 77702

A/C RH side - **Pantheon Chemical *Pre-Treatment* + *High Solids* Akzo Nobel Painting Scheme:**
PreKote non-chrome chemical conversion coating from Pantheon Chemical
Aviox CF Primer
Aviox Finish 77702

This will complete the spray application and flight test requirements of this program. C3P shall also conduct dip application testing (plating shop) within this time frame. Application and flight testing on a military aircraft is anticipated for January 2005 under the auspices of the Portuguese Air Force

Problems Resolved

- Data regarding the specific TAP and OGMA processes have been incorporated in the JTP and PAR format. We are currently awaiting stakeholder approval.
- Due to financial resource limitations, both TAP and OGMA have stated that they are unable to pay for test materials. ITB Eng. K. Andrews has successfully negotiated the supply of the test materials at no cost to TAP, OGMA or C3P

Current Problems

- As of September 30, C3P is currently awaiting TAP senior management approvals regarding application of test materials to their A319, but are pressing to secure facility resources and raw materials.

Travel

- July 12-21, Lisbon and Porto, Portugal (Rothgeb, Andrews)

Next Steps
- Complete the technical documents.
- Begin laboratory and field testing.

2. Demonstration and Validation of Non-Chrome Sealants

Objective
Test and implement alternatives to hexavalent chrome containing sealants used in aerospace industry to seal critical metal to metal joints and impart corrosion inhibiting properties. Hexavalent chrome containing sealants are used in the aerospace industry to seal critical metal-to-metal joints.

Achievements
- This project has been rescheduled due to limited resource availability at this time.

Problems Resolved
- None to report.

Current Problems
- No current problems to report during this period.

Travel
- July 12-21, Lisbon and Porto, Portugal (Rothgeb, Andrews)

Next Steps
- Prepare the following draft documents - JTP, PAR, CBA and Field Test demonstration / validation studies.
- Begin laboratory and field testing.

3. Replacement of High-VOC Coatings

Objective
Test and implement alternatives to currently used high VOC coatings by the Portuguese industry. This project has reciprocal benefit to NASA because we are currently working with the Joint Services to reduce VOC emission levels in domestic operations.

Achievements
- Adjunct to the July and September C3P face-to-face meetings it was decided that C3P would begin some preliminary work on this project.
- Application and flight-testing of a recommended low-voc coating system on a commercial aircraft is currently scheduled for the Oct 16 to Nov. 5 2004 timeframe under the aforementioned joint C3P TAP/OGMA field effort.

Problems Resolved
- None to report.

Current Problems
- No current problems to report during this period.

Travel
- July 12-21, Lisbon and Porto, Portugal (Rothgeb, Andrews)

Next Steps
- Prepare the following draft documents - JTP, PAR, CBA and any Field Test demonstration / validation studies.

- Begin laboratory and field testing.

4. Dem/Val of Alternatives to Chrome and Cadmium Plating on Fasteners and Engine Components; Landing Gear, Turbine Fans

Objective
Test and implement alternatives to chrome and cadmium plating on fasteners and engine components; landing gear, turbine fans, etc.

Achievements
- This project has been rescheduled due to limited resource availability at this time.

Problems Resolved
- None to report.

Current Problems
- No current problems to report during this period.

Travel
- July 12-21, Lisbon and Porto, Portugal (Rothgeb, Andrews)

Next Steps
- Technical meetings (tentatively July 2004) at OGMA / TAP to help solidify commitment and define project parameters

b. Financial Instrument for the Environment (LIFE) Projects

1. Portuguese National VOC Reduction Project

Objective
Identify, test, and validate low-VOC materials for commercial and industrial process in Portugal. This project is in support of EU Directive 1999/13/CE - to reduce both the direct and indirect effects of VOC emissions to human health. The Directive was adopted in Portugal by law DL nº 242/2001 which imposes;

a) Elaboration of plans for solvent management concerning involved industrial sectors
b) Elaboration of plans for solvent management for each industrial unit
c) Observation of compliance to emission limit values

Achievements
- Project proposal has been submitted to European body awaiting feedback.

Problems Resolved
- None to report.

Current Problems
- Neither Portuguese national nor European funding bodies have favored the proposal for this project; consequently, work in support of this effort has been cancelled until further direction is received from the C3P executive.

Travel
- July 12-21, Lisbon and Porto, Portugal (Rothgeb, Andrews)

Next Steps
- This effort will be dropped from further ITB reporting

c. Sixth Framework (Fr6) Programmed Projects

1. Lead-Free Solder Reliability ("MILEAD") Project

Objective
Design "green electronics" testing program that will complement JG-PP and other European lead-free testing programs. This project will address the impact of the following parameters on reliability:

- Solder alloy
- Board finish
- Components
- Tests and testing conditions

Achievements

- Project proposal has been submitted to European body, awaiting feedback.

Problems Resolved

- None to report.

Current Problems

- No current problems to report during this period.

Travel

- No travel to report during this period.

Next Steps

- C3P/NASA will continue to build stakeholder base as project is developing.
- Upon receipt of Fr6 authorization C3P shall define and scope project
- Initiate lead-free solder project

2. HISCA Project

Objective
Submit project proposal - Heavy Ions Substitution for SME Supply Chain in Aeronautics, "HISCA" to Fr6. This project address a reduction in the use of heavy ions in European aerospace processing.

Achievements

- Project proposal has been submitted to European body awaiting feedback.

Problems Resolved

- None to report.

Current Problems

- No current problems to report during this period.

Travel

- No travel to report during this period.

Next Steps

- C3P will continue to build stakeholder base as project is developing.
- Upon receipt of Fr6 authorization C3P shall define and scope project
- Initiate HISCA project

Conclusion

The NASA AP2 Program remains a very viable and active Agency program. All ITB resources are fully employed in providing support to develop and maintain the current level of programmatic and project efforts across the three business entities. The ultimate success of each project remains subordinated to the level of strategic direction provided by NASA, the individual performance of the project integrator, and from the responsiveness of those identified as project stakeholders. The ITB project integrators will continue to identify the challenges and risks for maintaining the level of program and project activity being conducted to the NASA AP2 Program Manager for direction.

APPENDIX A

NASA AP2 TRIP REPORTS

July – September 2004

Trip Report
Lead-Free Solder Project Site Visit
Rockwell Collins Facility
July 1, 2004

Location: Cedar Rapids, Iowa

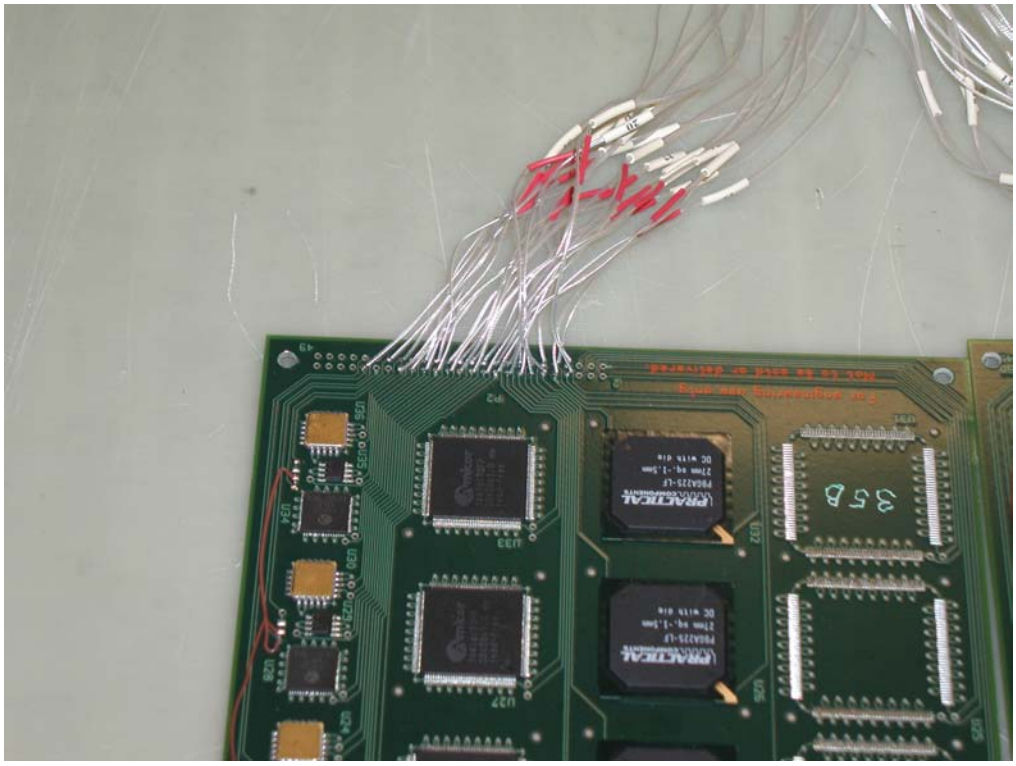
Objective:
The objective of the lead-free solder project site visit to Rockwell Collins was to view the testing equipment and test set up being used for thermal cycle testing -55 ºC to +125ºC. In order to obtain a better understanding of the testing procedures and the equipment used to complete testing, onsite visits of testing locations is required. Photo documentation of the test equipment, wiring and test chambers will be included in the Joint Test Report (JTR).

Attendees:

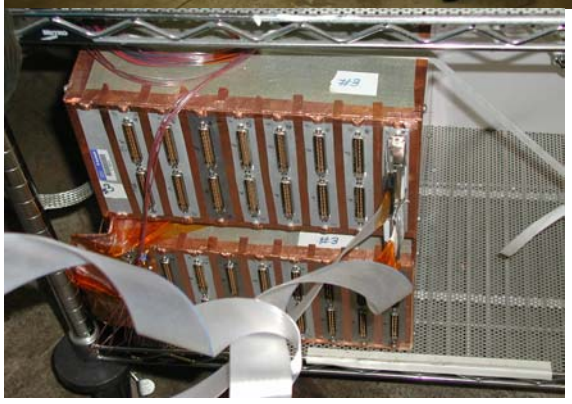
Kurt Kessel NASA AP2 Office; ITB, Inc.

Background and Rationale for Trip:
The NASA AP2 Office has been actively managing the JCAA/JG-PP Lead-Free Solder Project. In order to fully understand the testing procedures being completed, and to properly document the procedures for the JTR and interim reporting to stakeholders, site visits are a necessity. Site visits of testing locations also provide the NASA AP2 Office with the opportunity to gain a better understanding of facilities testing capabilities, information that will provide useful when considering other testing programs and projects.

Discussion:
The Rockwell Collins site visit started with a review of the board set-up and an explanation of how the wiring will be configured. Mr. Hillman explained that the circuit boards will not have a common ground on the board, each wire is grounded individually. Mr. Hillman is not using a connector on this board to connect the data collection wires to the boards. Each individual data collection wire will be soldered into the corresponding plated through hole on the board. The plated through holes located on the circuit boards that Rockwell Collins is processing for testing are not connected, not linked, they are independent. Since the CSP and Hybrid components are no longer on the boards, some plated through holes will be left empty, which does not affect the circuit. Wires not in plated through holes will be individually soldered together and taped to eliminate the risk of a short. All wires have been individually numbered for tracking purposes.



The wire cables being used to connect the circuit boards to the data collection devices are flat not round. This allows for multiple wires to be stacked and takes up a lot less room than round wire bundles. Wires are custom wire assemblies made for Rockwell Collins. The data collection device that Rockwell Collins is using was built in-house at Rockwell Collins. The device is modeled after the AnaTech device but has the capabilities to record a much higher number of channels.



Mr. Hillman reviewed the test chamber that is going to be used for the thermal cycle testing -55 ºC to +125ºC. Specifications and details, including thermal profiles for the test chamber will be provided at a later date for inclusion into the JTR. The test vehicles will be placed into the chamber on the long edge with the wire connectors at the top. The test vehicles will be placed onto two separate fixtures with 15 test vehicles being placed on the top rack and 15 test vehicles being placed on the bottom rack. Care will be taken to ensure adequate spacing between the test vehicles to allow for proper air flow so that heating and cooling temperatures are consistent across all test vehicles. Thermal couples will be placed in various locations in the chamber to ensure proper temperature. Thermal couples will also be placed onto the test vehicles to record the actual thermal profile being placed upon the test vehicles.

There is one set of plated through holes that are linked on the board. These plated through holes were initially intended to fill channel 64. When the test vehicle was originally configured and all of the chosen components were placed, 63 channels were required to monitor all of the components. Since 63 is an odd number and typical event detector hardware has a minimum capacity of 64 channels, the consortium decided to add the plated through onto the board to obtain additional data. For the test vehicles that Rockwell Collins is processing the plated through holes will be unlinked by either razor knife or power tool.

Mr. Hillman noted that the CSP components, which have been removed from the board, were shipped as the wrong sized component. There was not a design error as previously reported. The board was correct and the component order was correct but the supply company sent the wrong components. The CSP component was shipped with the wrong pitch, ball pitch.

During the site visit, Mr. Hillman explained that solder joints undergoing environmental testing can crack due to the applied stresses. The cracks in the solder joints can open and close several times over the course of testing while under stress. Each individual channel being monitored is linked to a single component, component leads have been daisy chained internal to the component. Failure criteria will be in accordance with the JTP. Once failed the actual solder joint that failed will be determined by analysis, x-ray, cross-section, visual, after testing is complete. Metallurgical analysis will be done to determine grain structure within the solder joints.

Kurt Kessel
ITB, Inc.

Trip Report
U.S. Navy & Industry RUST 2004
Corrosion Technology Exchange
July 12-15, 2004

Location: Clarion Hotel & Conference Center
Louisville, KY

Objective: The objective of attending the RUST 2004 Corrosion Technology Exchange was to gather information regarding current efforts in corrosion control, meet others with similar problems, and evaluate new technologies for possible NASA applications.

Attendees:

Pattie Lewis	Journeyman Engineer	ITB, Inc.	Kennedy Space Center

Background and Rationale for Trip:

The Corrosion Technology Exchange brings together professionals involved in research, academia, all branches of the military, shipyards, overhaul facilities and private industry, which are concerned with materials selection, corrosion prevention, and corrosion control. It allows attendees to hear about the latest industry technologies, as well as lessons learned by military activities. Many of the technologies used by the U.S. Navy and other branches of the military are easily transferred to industry and NASA applications. Due to the continually new materials and technologies being developed, it is important to attend conferences such as this to learn what others in the field are doing and to make contacts that could prove useful to NASA AP2 efforts.

Discussion:

Ms. Lewis attended four days of presentations that included service updates, academic research areas and vendor presentations. Ms. Lewis also visited several vendors' booths and spoke to them about their products and collected additional information that may be relevant to NASA.

Areas of Interest:

- Volatile Corrosion Inhibitors (VCIs) are compounds transported in a closed environment to the site of corrosion by volatilization from the source. VCIs have the potential to prevent corrosion of parts, including electronics, during shipping or storage.
- Salt-Away products are water-based, environmentally safe, salt removing products. Salt-Away completely removes fresh salt, breaks down layers of salt buildup, and inhibits rusting and corrosion. Stennis Space Center currently uses brackish water from canals on the test stands and has had problems due to the salts remaining on the structures—this is a possible solution. There may be other centers with similar problems, or even KSC may be able to use the product as part of a regular maintenance schedule to help reduce corrosion.
- Concurrent Technologies Corporation (CTC) is currently working with the Navy to test conductive polymers as non-chrome pretreatment alternatives. They have done work on steel alloys and plans for testing on aluminum are in the works.

Contacts of Significance:

- Nancey J. Maegerlein, Branch Manager of the Explosive Sciences Branch; NAVSEA—Crane, IL; 812-854-5506.
- Wayne (Skip) D. LeFleur, Chemical Engineer; CTC, Largo, FL; 727-549-7214 or Toll Free 888-745-3749.

Action Items:

- Get a copy of NAVSEA—Crane's report on Non-chrome primers from N. Maegerlein (P. Lewis)
- Get additional information regarding CTC's work with Non-chrome pretreatments (P. Lewis)

Pattie Lewis
ITB, Inc.

Trip Report
C3P Project Review Meetings
July 12 - 21, 2004

Location: Lisbon and Porto
Portugal

Objective: The objective of the meetings in Lisbon and Porto, Portugal were to review the C3P project areas and meet with existing and potential stakeholders regarding C3P capabilities and benefits of membership. The NASA team also supported several executive and project level meetings with C3P representatives to review project and programmatic obstacles and accomplishments.

Attendees:

Matt Rothgeb	Engineer	ITB, Inc.	Kennedy Space Center
Kevin Andrews	Senior Principal Engineer	ITB, Inc.	Kennedy Space Center
Joana Vide	Engineer	ITB, Inc.	Lisbon, Portugal
P. Castello Branco	Director General	C3P	Lisbon, Portugal
David Amidei	Environmental Lead	NASA HQ	Washington D.C.
Christina Brown	NASA AP2 Program Manager	NASA KSC	Kennedy Space Center
Kristin Kane	US Embassy in Portugal	State Dept.	Lisbon, Portugal

Background and Rationale for Trip:
This trip was undertaken as per the agreed support by NASA to C3P as stipulated and confirmed in the C3P Joint Statement and Terms of Reference. This trip supported the C3P mission to identify and evaluate industrial processes where hazardous materials (lead, chromium, cadmium etc.) and volatile organic compounds (VOCs) are used, and to identify viable technologies or processes that satisfy European Union (EU) and Portuguese environmental legislative and regulatory limit requirements.

NASA supports the C3P mission to identify potential partnerships among Portuguese and EU entities, including SMEs, who share common environmental technology needs. Project areas that are currently of interest to C3P include, but are not limited to the following:

- Demonstration and validation of suitable alternatives to hexavalent-chrome (Cr^6) in conversion coatings and primer coatings
- VOC and HazMat free technologies for depainting on aluminum and composite substrates
- Demonstration and validation of alternatives to cadmium plating for aircraft components
- Lead-free solder alloy formulation and reliability testing

Discussion:
This visit provided several key developments. The aforementioned team was hosted by ISQ, INEGI, SPI and the Portuguese Air Force during this visit. The details of these meetings are further addressed within the body of this document.

July 13, 2004 -

[Present: (Diego Talone, Pecho Martianho, Carla Jesus, Sandra Costa, Vitor Goncalres, Ana Matos, David Amidei, Matt Rothgeb, Joana Vide, Eduardo Lopes)]

Mr. Rothgeb met with TAP and OGMA Engineers at OGMA Facilities, to discuss the Joint Test Protocol and Potential Alternatives Report for the Chrome Free Conversion Coatings Project. The engineers with both TAP and OGMA were satisfied with the JTP and PAR and were interested in what next steps were to be taken. Mr. Rothgeb notified engineers that C3P would be meeting with the Portuguese Air Force later in the week to discuss field testing of Alodine, 5200/5700 and X-It Prekote.

Additionally, during the visit to OGMA, there was brief discussion of MILEAD companies and progress on lead-free project proposals. It was noted that funding would not be available from Portuguese government sources for this project because both parties (ISQ and INEGI) were located in areas of Portugal that were not permitted to apply for such funding.

July 14, 2004 -
Meetings were planned to discuss the Lead-Free Solder Reliability Project (MILEAD) and a tour of the ISQ facilities for Mr. David Amidei. ISQ (Eng. Dias Lopes) gave a presentation on the capabilities of their organization regarding testing, inspection and management, and the group was later treated to a tour of the ISQ facilities. The planned visits to MILEAD project related companies were cancelled by ISQ.

July 15, 2004 -
Members of C3P, accompanied by the NASA/ITB contingent, met with the Portuguese Air Force to discuss the ongoing efforts of the C3P in potential projects involving OGMA and Portuguese industries. The Air Force representatives were very interested in the efforts of C3P and were equally interested in working with the group. Mr. Andrews presented a summary of C3Ps history and the two proposed projects that both TAP and OGMA are active stakeholders in. The Air Force was very interested in being involved in the projects and informally agreed that field testing of alternatives to currently used hexavalent chrome conversion coatings on one or more OGMA serviced, Air Force owned aircraft would be acceptable if the alternatives had indeed passed initial US Air Force flight testing.

July 16, 2004 -
The group completed project meetings in Porto with INEGI, SPI and Kimestan Aerospace Coatings. Andrew Oxenford, CEO Kimetsan Aerospace and Defence Coatings Ltd, gave a presentation on the capabilities of the Kimetsan D45-AMS coating system and fielded questions from the group regarding the environmental benefits if this system, as well as its resistance to chemical deterioration in a variety of performance environments.

Met with SPI (Sociedade Portuguesa de Inovação) to discuss their capabilities and to announce their partnership with the C3P. SPI's mission is stated as: "The management of projects which foster innovation and promote international opportunities; when appropriate, such missions will be accomplished through the creation of strategic partnerships." Services of SPI include consulting services, research and development, project management and training.

July 19, 2004 -
Meetings with D. Amidei, C. Brown, C. Branco, M. Rothgeb, K. Andrews, and J. Vide were conducted to discuss the ongoing progress of projects and conclusions from the facilities visited. Included in these discussions was clarification of action items.

Contacts of Significance:

- Sara Medina, Porto, Portugal (351.22.607 64 00, SaraMedina@spi.pt). Consultant
- Andrew Oxenford, London, England (44.1330.860.000, andrewoxenford@aol.com). CEO

Recommendations:

1. It is recommended the PoAF formally join C3P
2. The Kimetsan coating may be revolutionary in capabilities, as such it is recommended that it be further reviewed for viability in NASA testing and applications. Appropriate steps shall be taken to invite Mr. Oxenford to the upcoming C3P International Workshop.

Action Items:

- Provide Eng. Joana Vide Pereira with technical data regarding PreKote use on military aircrafts and corroborating US Air Force test data (Andrews, Rothgeb)

Matt Rothgeb
Kevin Andrews
ITB, Inc.

Trip Report Lead-Free Solder Project Site Visit Boeing Phantom Works, Renton Washington August 5, 2004

Location: Renton, WA

Objective:
The objective of the lead-free solder project site visit to Boeing Phantom Works was to view the testing equipment and test set up being used for thermal shock testing, vibration testing and thermal cycle testing -20 ºC to +80ºC. In order to obtain a better understanding of the testing procedures and the equipment used to complete testing, onsite visits of testing locations is required. Photo documentation of the test equipment, wiring and test chambers will be included in the Joint Test Report (JTR).

Attendees:

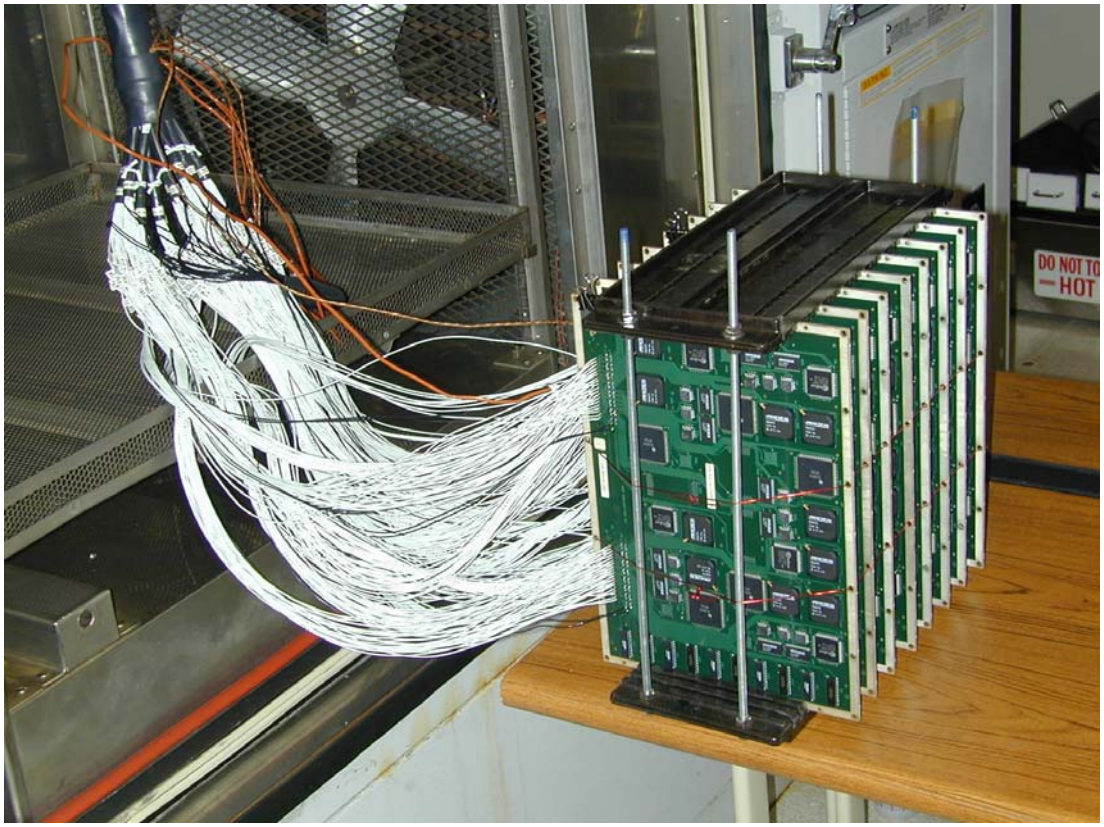
Kurt Kessel NASA AP2 Office; ITB, Inc.

Background and Rationale for Trip:
The NASA AP2 Office has been actively managing the JCAA/JG-PP Lead-Free Solder Project. In order to fully understand the testing procedures being completed, and to properly document the procedures for the JTR and interim reporting to stakeholders, site visits are a necessity. Site visits of testing locations also provide the NASA AP2 Office with the opportunity to gain a better understanding of facilities testing capabilities, information that will provide useful when considering other testing programs and projects.

Discussion:
The Boeing Phantom Works site visit started with a review of the thermal shock test setup. Dr. Woodrow stated that the thermal shock test started on July 24, 2004. Thermal shock testing will be run in 4 lots and testing is expected to be completed late December 2004. AnaTech data detection devices are being used to monitor the mechanical shock testing. The mechanical shock test is currently producing data results. Dr. Woodrow indicated that following the second run of thermal shock test vehicles, in-progress data analysis could be provided, including possible projections on how well the lead-free solder alloys are performing when compared to the tin-lead controls.

The thermal shock test will be conducted under the following criteria: • -
55°C to +125°C
. • 1000 shock cycles
. • 10 sec, max transfer
. • 15 minutes, dwell

Test vehicles wired and ready for the Thermal Shock chamber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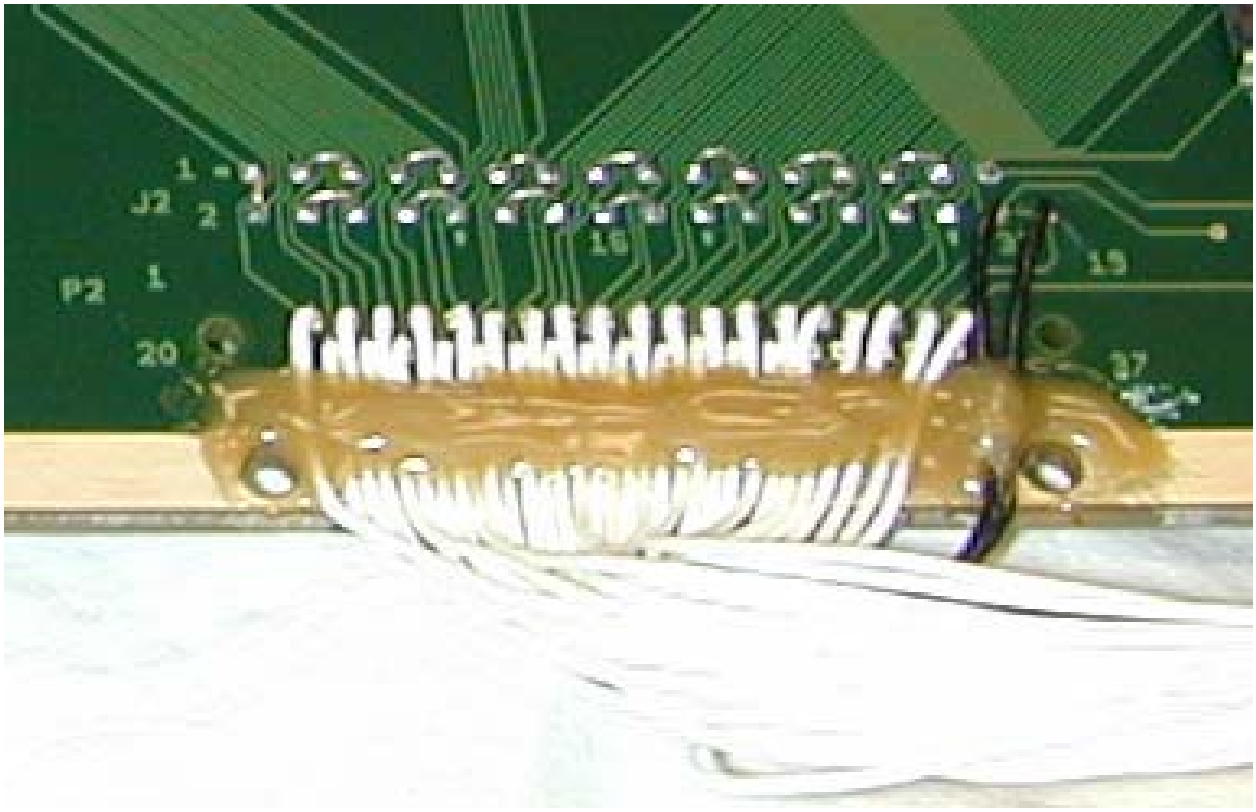
Thermal Shock test chamber

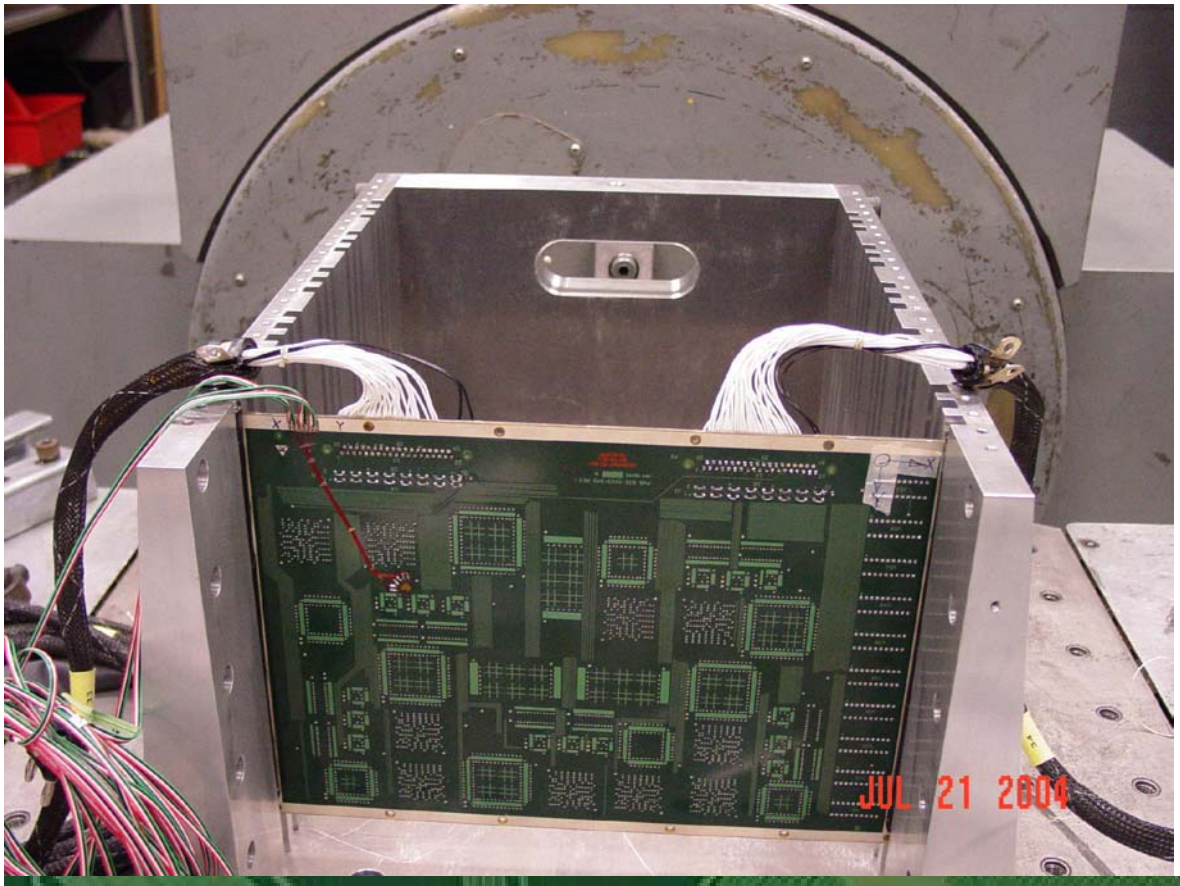
Data analysis and recording equipment; Thermal Shock test

Following the review of the thermal shock test, Dr. Woodrow reviewed the board set-up and explained how the wiring will be configured. Dr. Woodrow explained that the circuit boards will have a common ground on the board. The plated through holes that serve as grounds for the component traces will be daisy chained together. Plated through holes numbered 32 & 33 will be filled with the ground wires. Dr. Woodrow is not using a connector on this board to connect the data collection wires to the boards.

Daisy chained plated through holes dedicated for ground wires; test vehicle prepared for vibration test After Dr. Woodrow explained the wiring design, we reviewed the vibration test set-up. Dr. Woodrow stated that the vibration test will start on or around August 31. The vibration test will be run in two sets consisting of 15 boards each. A special fixture, milled out of aluminum, was made by Boeing to hold the test vehicles. The fixture was designed with port-holes. The port-holes will allow for the removal of components that have shaken free from the board, reducing the risk that these components will bounce around inside the fixture and cause damage to the board's in-test. The data recording wires were glued to the board in order to reduce the risk of recording failures associated to loose or broken wires and not board to component solder joints. Dr. Woodrow explained that he expects to see the majority of component failures to occur while the test is being run in the z-axis. It is expected that the first components to fail will be located along the center line of the board. A laser vibrometer was used to determine the mode shapes and frequencies of the JCAA/JG-PP test vehicle. The measured first resonance frequency was 72 Hertz (our calculated prediction was 80 Hz). The laser vibrometer data will be converted into strain data using Boeing proprietary software. The vibrometer strain data will be compared to strain data from strain gauges mounted on the test vehicle during the test to see how well they compare. This data will allow CALCE to perform PoF (Physics of Failure) modeling, the application of techniques that simulate physical growth/degradation process that ultimately result in failure of a defined structure by a specific failure mechanism.



Test vehicle secured in the specially designed fixture Wires glued onto the board in preparation for the Vibration test Laser Vibrometer set-up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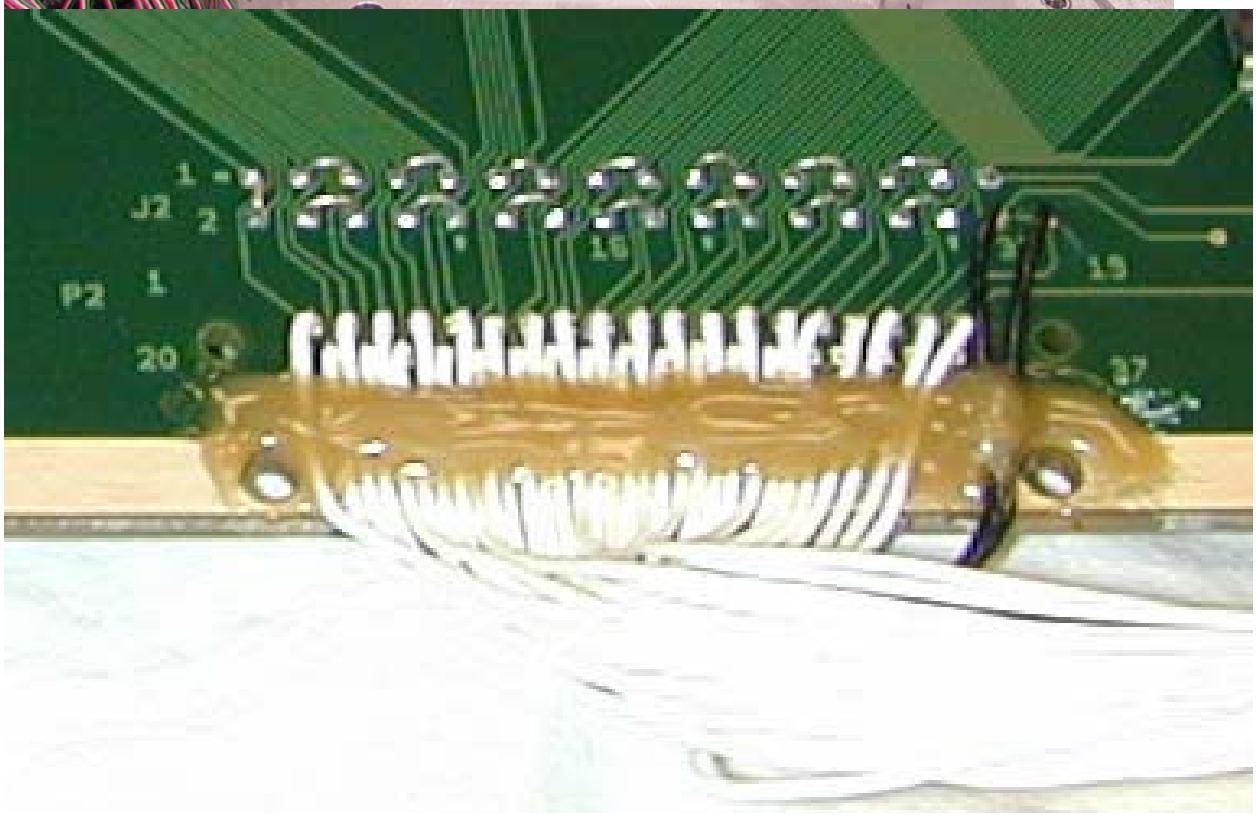
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Following the review of the vibration test, Dr. Woodrow reviewed the test chamber that is going to be used for the thermal cycle testing -20 ºC to +80ºC. Specifications and details, including thermal profiles for the test chamber will be provided at a later date for inclusion into the JTR. Care will be taken to ensure adequate spacing between the test vehicles to allow for proper air flow so that heating and cooling temperatures are consistent across all test vehicles. Thermocouples will be placed in various locations in the chamber to ensure proper temperature. Thermocouples will also be placed onto the test vehicles to record the actual thermal profile being placed upon the test vehicles.

Thermal Cycle test chamber

Trip Report
JCAA Lead-Free Solder Project Business Meeting
August 9, 2004

Location: Office of the U.S. Air Force Aging Aircraft Division
Wright Patterson Air Force Base, Ohio

Objective: The main objective of the Lead-Free Solder Project Business Meeting was to better define the business plan, including funding sources for testing activities.

Attendees:

ATTENDING	AFFILIATION	EMAIL
Christina Brown	NASA KSC YA	christina.m.brown@nasa.gov
Lisa Dillard	ASC/AAA	lisa.dillard@wpafb.af.mil
Mike Dooley	ITB, Inc	dooleym@itb-inc.com
Brian Greene	ITB, Inc	greeneb@itb-inc.com
Richard Hricko	ASC/AAA (Alion)	richard.hricko@wpafb.af.mil
Dennis Jarvi	ITB, Inc.	djarvi@itb-inc.com
Kurt Kessel	ITB, Inc.	Kurt.Kessel-1@ksc.nasa.gov
Carl Loden	ITB, Inc.	lodenc@itb-inc.com
Michael Snyder	ASC/AAA	michael.snyder@wpafb.af.mil

Background and Rationale for Trip:
The purpose of this meeting was two-fold: For the NASA principal (Christina Brown) to meet the new Air Force principal (Michael Snyder) and to discuss the status of the Lead-free Solder project, with emphasis on funding.

Project Status:
Combined Environments Testing (CET):
ASC/AAA forwarded $60K to GSA for completion of the Combined Environments Test. As written, the statement of work (SOW) does not allow the Air Force to fund for the test. It was concluded that there is a need to modify the SOW and/or contract to include the CET. Mr. Hricko will work with GSA to resolve the issue.

Hybrid/CSP Testing:
Mr. Kessel briefed that, based on initial inquiries; $130K was needed to test new boards with the hybrids and Chip Scale Packages (CSPs)._Ms. Lisa Dillard, ASC/AAA Financial Manager, commented that there was approximately $80K available of FY 03 funds. She cautioned the project managers that they must act quickly to request the funds. She then excused herself to attend another meeting. Ms. Brown confirmed that NASA could provide $50K towards the test for a total of $130K. Mr. Hricko suggested that the Air Force ask for $130K and NASA keep their $50K in reserve. Mr. Snyder and Ms. Brown agreed to this idea._Ms. Dillard needs to have the funds out of ASC/AAA NLT midnight 29 Sep. She will have the funds in her hands in two weeks. NASA will fund Rockwell Collins to conduct their portions of the tests; and the Air Force will fund the boards and Boeing Phantom works to accomplish the tests. Ms. Dillard said there is not much FY 05 funds available and that she has already given the FY 05 travel funds to Mr. Synder that will come his way.

Funding Status:

Ms. Brown asked the Air Force to pick up 10 trips to cover the lead-free solder project. Mr. Hricko said this would be included in with the request for $130K. She asked that the June 05 planned data analysis is deep enough to influence what tests are necessary for the next phase of the project. Mr. Hricko and Mr. Snyder agreed.

Ms. Brown briefed that there would be no FY 06 funds from NASA Headquarters, her source for dem/val funds in the past. She will have to find funding from other, yet-to-be identified sources. The FY 07 budget for ASC/AAA will be due in 2 months. It was stressed that we must defend funding for this project. It was also pointed out that with increased funding the project could be accelerated

Discussion:
Mr. Brian Greene displayed a chart that mapped out the next three phases of the project together with a very rough order of magnitude of costs together with industry contributed resources to the project. It was thought about a year would be needed to analyze the results of the first set of tests and to develop a prudent plan for the second phase to begin in FY 06. The idea behind phase 2 is to obtain specific circuit card assemblies (CCAs) that have a high failure rate due to solder. New cards will be built with qualified lead-free solders. They will be lab tested and then ultimately flight tested.

The third phase of tests anticipates carrying the lead-free components to a completely Line Replacement Unit (LRU) level to be first tested under laboratory conditions and then flight tested.

It was agreed that by 2010 industry will be lead-free and that we need to keep pushing this project forward. The alternative would be to be unprepared when the lead-free
solders start showing up in our electronic components.

Kurt Kessel
ITB, Inc.

Trip Report
Demonstration of Portable Laser Coatings Removal Systems for NASA Partners
Wright-Patterson Air Force Base
Dayton, Ohio
August 9-11, 2004

Location: **Wright-Patterson AFB, Area B - Bldg 71A**
Dayton, OH

Objective: The objective of this site-visit to WPAFB was for GRC and KSC Engineers to witness demonstrations of laser stripping technologies. In turn, it was an objective for these interested parties within NASA to see the technology and determine how it could best be used within maintenance and manufacturing operations at their perspective facilities. The NASA AP2 Office coordinated the visit to determine the viability of a joint NASA project dealing with laser stripping as a follow on to the Joint Group for Pollution Prevention (JG-PP) project J-00-CR-017 entitled: "Portable Laser Coating Removal System" (PLCRS).

Attendees:

Charlie Lee	United Space Alliance	M&P Engineering
Christina Brown	NASA	AP2 Office Manager
David Headley	Boeing	Project Engineer
Ken Wagner	United Space Alliance	Structural Engineer
Larry Nielsen	United Space Alliance	TPS Manager.
Linda Sekura	SAIC	Environmental Research
Martin Boyd	NASA	Structural Engineer
Marvin Banks	Boeing	TPS M&P
Matt Rothgeb	International Trade Bridge	NASA AP2 Engineer
Pete Wagner	United Space Alliance	Project Leader
Phil Beck	NASA	Mechanical Engineering Technician
Sandy Rozzo	United Space Alliance	TPS Engineer
Sreevatsa V. Chakravarthy	United Space Alliance	Subsystem Area Manager, M&P
Steve Hayes	NASA	Mechanical Engineering Technician
Robert Hull	Anteon	Program Manager
Harold Hall	Anteon	Paint Stripping Coordinator
Gerard Mongelli	CTC	

Background and Rationale for Trip:
Current methods being used within various coating removal processes for small to medium sized areas include hazardous chemical and physical methods. These methods can be expensive, time-consuming, labor-intensive, and many have large and/or unwanted hazardous waste streams related to their processes.

Laser technology is currently in use within several manufacturing operations at many facilities. These operations include welding, cutting, drilling and surface preparation. Using lasers for coating removal, however, introduces a new use for this technology. Additionally, the laser coating removal process is less labor-intensive and more environmentally friendly than other currently used methods.

The JG-PP PLCRS Project has been ongoing since 2001, and is nearing testing completion. Headquarters Air Force Material Command (HQ AFMC) and the Air Force Research Laboratory (AFRL) have been in charge of evaluating the use of several lasers for small area and supplemental coating removal for maintenance and sustainment applications. This evaluation includes testing and qualifying handheld yttrium aluminum garnet crystal doped with neodymium ions (Nd:YAG), transversely excited at atmospheric pressure-carbon dioxide (TEA-CO2) and diode laser technology for the removal of conventional and specialty coatings from metallic and composite substrates. All test panels involved in this project have been through several strip and repaint cycles and have undergone or are currently undergoing materials testing to determine if any damage can be seen on the tested panels due to stripping with lasers. While the JG-PP project will be complete with a published Joint Test Report (JTR) in December of 2004, there have already been follow-on tests scoped for specific applications or materials.

Mr. Larry Nielsen from KSC and Mrs. Linda Sekura from GRC contacted the AP2 Office on separate occasions earlier this year concerning the ongoing PLCRS project and the possibility of a demonstration of this technology to determine if it could be used in shuttle, aircraft, facilities and ground service equipment applications. Because of the joint interest of two NASA Centers concerning a similar technology, the NASA AP2 Office determined that a site-visit to the laser test facility at Wright-Patterson AFB would best suit both parties and would provide the opportunity for each to see multiple laser systems that have been involved in this study.

Prior to the site visit a 'KSC Portable Laser Coating Removal System Project' meeting was held with KSC stakeholders to discuss the options and purpose for considering this technology. During this meeting, TPS, M&P and Structural Engineers discussed the concept of starting a year-long FY2005 study of various portable laser coating removal systems that could be used for removing paint, RTV and other materials from both flight and non-flight equipment. It was during this meeting that the AP2 Office (Mr. Brian Greene) noted that GRC was also interested in reviewing this type of technology for use on aircraft and that a joint-NASA Project could be beneficial for both parties. Mr. Greene also suggested that the NASA AP2 Office serve as "project administrator" for the study.

For such a project, the NASA AP2 Office would help the technical teams from KSC, GRC and any other NASA stakeholders develop the necessary documents to prove the technology through demonstration and validation and assist in the implementation of selected technologies.

In light of the fact that two NASA Centers were interested in this type of technology for similar applications it was proposed that a site-visit be schedule and both parties send representatives to view the systems and to test each using their own test-panels developed to strip while visiting the site. This would help each group to gather some preliminary information regarding effectiveness of the lasers.

Discussion:

August 9, 2004

Mr. Rothgeb met with personnel from KSC, GRC at WPAFB during the afternoon of August 9th for an overview of the current laser project, a question and answer session and a laser safety overview. The goals of each group were briefly discussed and the group participated in a tour of the PLCRS lab and the Laser Hardened Materials Evaluation Lab (LHMEL).

Glenn Research Center sent three aluminum test panels from aircraft, coated with the coatings that they are interested in stripping at their facility. While this was the primary reason for their interest in laser stripping, they may also be interested in other stripping applications that such a laser can be used for within their facility.

Kennedy Space Center sent five test panels. Four of the panels were aluminum and one was a composite honeycomb/aluminum material. Each test panel was coated with Koropon paint. Some test panels included anodize layers as well. Additionally some panels consisted of Koropon and RTV. One test panel was a mock-up of the Shuttle tile cavity, as it would appear when one tile is missing prior to replacement. The interests of the KSC team were to demonstrate the following:

- Demonstrate ability to remove Koropon from aluminum plate without disturbing anodized layer.
- Demonstrate ability to remove Koropon from honeycomb article without disturbing anodized layer or debonding the face sheet.
- Demonstrate ability to remove RTV and Koropon from aluminum plate.
- Attempt to remove RTV from plate without removing Koropon.
- Determine any preliminary effects laser energy has on RTV, Filler Bar and Thermal Protective System Tiles.

August 10, 2004

Mrs. Christina Brown from the NASA AP2 Office briefly spoke with the stakeholders present about the NASA AP2 Program and its capabilities to assist this group and others with joint-NASA projects to reduce duplication of effort within NASA and the DoD.

During the second day of the visit to WPAFB, each group was given the opportunity to have their panels tested with the various laser systems and end-effectors. It should be noted that two of the lasers originally used during testing for the PLCRS project are no longer being used by the laser lab due to the requirements of the PLCRS project.

The TEA-CO2 laser was eliminated from the study part way though the project because of its design. It was too bulky for the average work place and worker to use effectively. Additionally the CO2 laser used mirrors to move the laser light through a series of pipes to the end-effector. Because of this, any misaligned mirrors meant that the system could not be used properly, thus making it less robust than other systems being tested.

The Diode laser was eliminated from the study because it was not designed to be a hand-held laser and only sheets of material could be placed under the beam and stripped. This limited the effectiveness of the system and because of this design problem, it was removed from the testing after preliminary tests.

The lasers in use during this site visit consist of a 40W Nd:YAG Laser, 120W Q-Switched Nd:YAG Laser and a 500W Q-Switched Nd:YAG Laser. The first two units were present in the laboratory during the entire visit while the 500W was being shipped to WPAFB concurrently with the visit and did not arrive on-site until the afternoon of August 10th. While the 500W was never used during this visit, a specialized end-effector for smaller areas that provides greater maneuverability was borrowed from the system and used on the 120W system.

Glenn Research Center used the 40W and the 120W laser to test stripping some aluminum panels and was pleased with the preliminary tests. The AP2 Office will work with Linda Sekura to incorporate any follow-on testing they may require in any NASA Laser Project coordinated by the AP2 Office.

Kennedy Space Center tested the 40W and 120W lasers as well, and used all three end-effectors to determine their various preliminary goals. The AP2 Office is working with Larry Nielsen to organize a follow-on project to the PLCRS project that will help the KSC team to demonstrate and validate laser stripping as an alternative to bead-blasting and chemical stripping of surfaces within the Shuttle environments. Additionally, both groups noted that the area of Ground Service Equipment (GSE) should be explored as well during any future projects in addition to aircraft and aerospace equipment. Any follow-on project should also look to validate the technology for use on non-flight GSE at the facilities involved. This would allow for a greater use of a laser unit and further validate the cost of equipment within NASA depots.

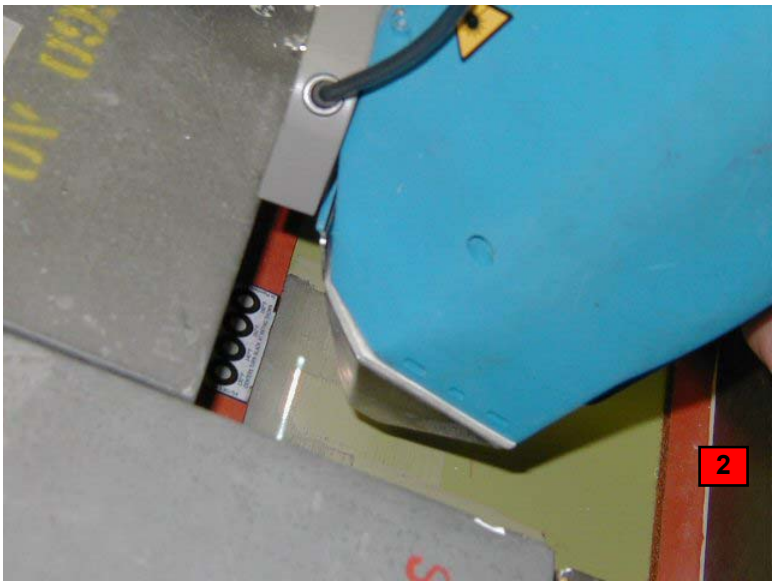
August 11, 2004

During the final day of the site-visit, participants were given an opportunity to discuss their observations of the preliminary testing as well as any concerns they have for a future project. The KSC group noted that anodize layer on Shuttle equipment cannot be removed as a part of the stripping process. While bead blasting is used currently and does not remove anodize, the damage that is caused to TPS is of concern. Wet sanding or other removal methods can remove anodize, the amount of such removal is unknown.

Overall, the KSC group noted that they were still very interested in the FY05 project for testing lasers for stripping applications. The GRC group was unable to attend on August 11th, but noted on the previous day that the technology showed promise for their currently identified needs an most likely some other areas of need that were yet to be identified surrounding GSE.

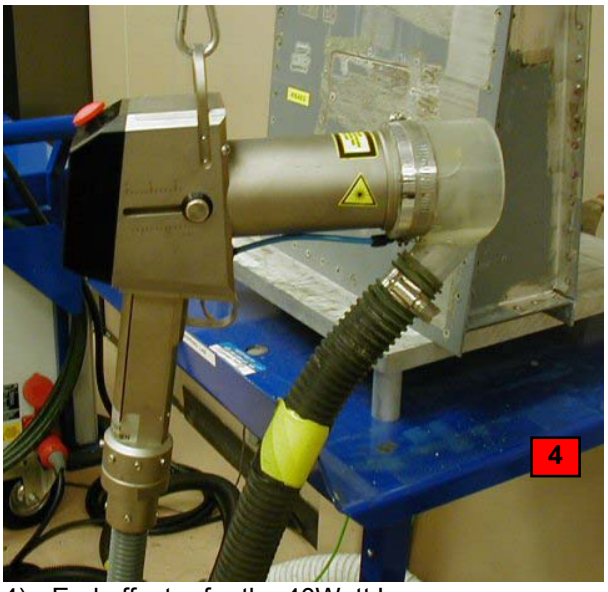
The NASA AP2 Office noted any action items that were informally assigned to the groups. The AP2 Office will distribute such actions and complete any actions assigned to their office. Most of these actions relate to bringing stakeholders up to speed on the JG-PP project and its test results.

1) Q-Switched Nd:YAG Laser (120 Watt)

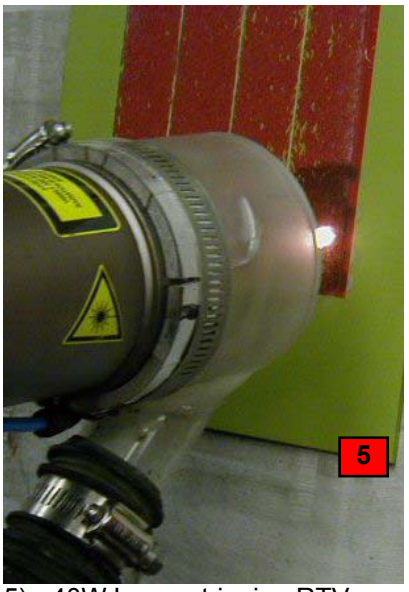


2) 120W Laser stripping Koropon from inside Shuttle tile

3) Nd:YAG Laser (40 Watt)



4) End effector for the 40Watt Laser.

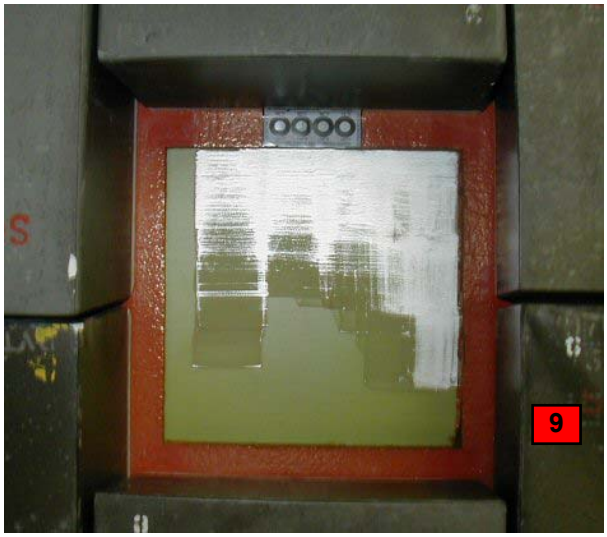


5) 40W Laser stripping RTV from Koropon painted

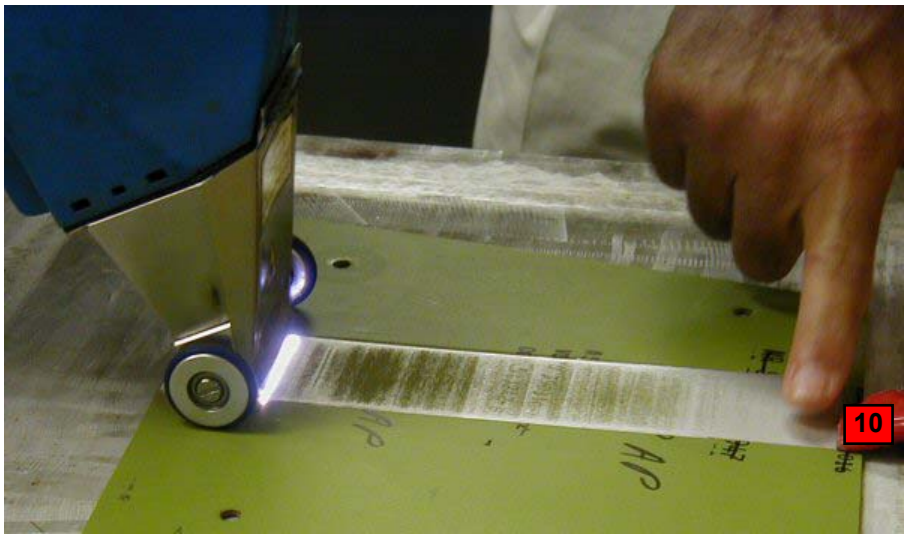
6) 120 Watt (Can also be used with 500 Watt) 'stylus' end effector.

7) Controls for stylus end effector (Similar controls are found on each of the stripping end effectors to adjust such things as the pulse frequency and area affected when in use.)

8) Stylus being used to strip paint from Shuttle tile mockup very near to the filibar. This shows the ability of the stylus to reach more difficult places with greater precision than other end effectors used during the PLCRS study.



9) Shuttle tile mock-up after initial stripping 120 Watt laser.



10) 120 Watt laser using roller head for end effector to strip test using the Koropon coated aluminum substrate.

Contacts of Significance:
Outside of the contacts that were invited to the site-visit, several personnel of the laser facility were very helpful during the demonstration and will be ready to assist the AP2 Office in any future laser projects and have offered assistance in answering preliminary questions the visiting groups may have in the interim.

- Randall Straw CTC, Dayton, Ohio - Project Manager.
  (937 255-5598; randall.straw@wpafb.af.mil)
- Thomas Naguy, Dayton, Ohio - Technical Manager
  (937 656-5709; thomas.naguy@wpafb.af.mil)
- Gerard Mongelli, CTC, Dayton, Ohio - Manager, AF Programs
  (937 426-2057; mongellg@ctc.com)
- Robert J. Hull, Anteon, Dayton, Ohio - Program Manager
  (937 252-3132 ext.3009; rhull@anteon.com)
- Harold (Pete) Hall, Anteon, Dayton, Ohio - Paint Stripping Coordinator
  (937 252-3132 ext.3012; phall@anteon.com)

Recommendations:

3. Efforts should be made by GRC, KSC and the NASA AP2 Office to determine what future follow-on testing is needed to fulfill any demonstration/validation requirements necessary for implementation of a laser stripping unit at their facility.
4. Each entity should determine the applications that are most probable for implementation (Ground Service Equipment, Aerospace Flight Equipment, Non-Flight Equipment, Shuttle, Facilities Maintenance, Structures, Etc.) and what materials would have to be tested (coatings and substrates) to ensure that all follow on testing is accomplished upon completion of the JG-PP PLCRS Project.
5. GRC, KSC and the AP2 Office should make efforts to determine if there are other NASA facilities/programs that may also have an interest in participating in a Portable

Action Items Assigned:

NLaser.08.11.04.N01

Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb), G. Mongelli**
Required Action: The AP2 Office will assist Mr. Mongelli in finding documentation detailing studies performed with lasers on anodized surfaces.
Comments: *G.Mongelli will attempt to find the information surrounding a study of Anodized Layer Effects due to Laser Exposure.*
Status: OPEN

NLaser.08.11.04.N02

Date Due: **08/31/04** *Responsibility:* **G. Mongelli**
Required Action: Mr. Mongelli will contact laser companies that are involved with the PLCRS Project to determine if leasing units is possible for any NASA follow-on projects and if an on-site demonstration of those units is possible.
Comments: *None.*
Status: OPEN

NLaser.08.11.04.N03

Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb)**
Required Action: The AP2 Office will attain the Joint Test Protocol and the Potential Alternatives Report and from the JG-PP PLCRS Project and forward them to Mr. Larry Nielsen and Mrs. Linda Sekura.

Comments: *Mr. Rothgeb will forward these documents as well as any preliminary test results that will be included in the Joint Test Report upon completion.*
Status: OPEN

NLaser.08.11.04.N04
Date Due: **09/7/04** *Responsibility:* **All Stakeholders (KSC, GRC)**
Required Action: Stakeholders are to review the JTP and PAR and look for additions that would be necessary to adopt them as a JTP and PAR for the purposes of their follow-on project.
Comments: *Any additional materials, testing and procedures as well as alternative laser systems or equipment should be added to the new JTP and PAR.*
Status: OPEN

NLaser.08.11.04.N05
Date Due: **12/31/04** *Responsibility:* **Mr. Mongelli, AP2 Office (Rothgeb)**
Required Action: JGPP will complete the Joint Test Report by the end of the year (2004). Upon completion, the document will be sent to Mr. Rothgeb who will forward the documents to Mr. Larry Nielsen and Mrs. Sekura to be distributed to their groups accordingly.
Comments: *None.*
Status: OPEN

NLaser.08.11.04.N06
Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb)**
Required Action: Mr. Rothgeb will collect a list of names of personnel who request access to the DoD Laser Library. This list will include all those that visited the PLCRS Laser Lab during the August Face-to-Face.
Comments: *None.*
Status: OPEN

NLaser.08.11.04.N07
Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb)**
Required Action: Mr. Rothgeb will attain cost estimates from the JG-PP PLCRS Project and any CBA's completed related to the laser project ongoing. This information will be forwarded to the appropriate personnel from KSC and GRC.
Comments: *None.*
Status: OPEN

NLaser.08.11.04.N08
Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb)**
Required Action: Mr. Rothgeb will attain the safety plan developed by the PLCRS group for on-site demonstrations and forward the information to Mr. Larry Nielsen and Mrs. Linda Sekura.
Comments: *None.*
Status: OPEN

NLaser.08.11.04.N09
Date Due: **08/31/04** *Responsibility:* **AP2 Office (Rothgeb)**
Required Action: Mr. Rothgeb will determine if any corrosion-removal testing has been performed by any lasers involved in the PLCRS project as well as any other ongoing or completed DoD laser project. If there is any information attained of value, it will be forwarded to the appropriate personnel within KSC and GRC accordingly.
Comments: *None.*
Status: OPEN

Matt Rothgeb
ITB Inc.

Trip Report
Macromedia ColdFusion Training
Aug. 16 – Aug. 18, 2004

Location: Orlando, FL

Objective:
The objective of the Macromedia ColdFusion Training is to learn how to make updates, and modifications to the NASA AP2 Integrated Technology Database (ITDb) (www.ap2-itd.com). Training was presented by SunTech3, Inc., a Macromedia authorized training partner 2004.

Attendees:
Cassandra Carroll - ITB, Inc.

Background and Rationale for Trip:
The NASA AP2 ITDb , which is based on a Microsoft Access database platform has been web enabled by way of ColdFusion and the NASA AP2 program office is now in the phase of updating the data to make it a more robust and useful tool.

Discussion:
The intensive 3-day training ColdFusion program focused on best practices and stressed the importance of usability, optimization, and performance. The course outline was as follows:
Fast Track to ColdFusion MX Course Outline
Lesson 1: Course Overview
Lesson 2: Introducing ColdFusion MX
Lesson 3: Getting Started
Lesson 4: Publishing Database Content
Lesson 5: Reusing Templates
Lesson 7: Building Search Interfaces
Lesson 8: Building a Data Drill-Down Interface
Lesson 9: Inserting New Data
Lesson 10: Updating Data
Lesson 11: Maintaining Session State

All assigned tasks were completed with-in the 3-day course. The training has proven to be very useful in being able to make the basic changes and updates to the ITDb. I do feel however, that if any major modifications need to be performed on the ITDb that further ColdFusion training would be needed; as a 3-day introduction course simply does not begin to cover all of the inner programming aspects to ColdFusion.

Cassandra Carroll
ITB, Inc.

Trip Report
39th Annual International Logistics Conference & Exhibition 2004
August 31 – September 2, 2004

Location: Norfolk Waterside Marriott, Norfolk, VA

Objective: Provide outreach to the DoD logistics community concerning the JG-PP program.

Attendees:

Brian Greene	Principal Sr. Engineer	ITB, Inc.	Kennedy Space Ctr

Background and Rationale for Trip:
In May 2004, Mr. Lee Whiteman (610) 362-1200 x208; lwhiteman@aciusa.org), Senior Manufacturing Engineer at the American Competitiveness Institute (ACI) and a long-standing member of the JCAA/JG-PP Lead-Free Solder project, contacted the AP2 Program Office seeking a speaker for 39th Annual International Logistics Conference that ACI was helping organize of behalf of the Society of Logistics Engineers (SOLE) in Norfolk, VA August 31 to September 2, 2004. ACI and SOLE were looking for papers and presentations to support a Concurrent Best Practices session, the purpose of which was to "to highlight [to logisticians] the tools and techniques that have proven successful in achieving the goals and objectives supporting the objectives of integrated processes. Speakers will offer business cases that offer models and tools for use at any point – present to future – in the road to the growth of the enterprise."

Mr. Greene subsequently sought and received JG-PP Working Group approval for him to present an overview of JG-PP at the Logistics Conference on behalf of JG-PP, with the suggestion that a focus area for the presentation be on lead-free solder risks to logisticians. Mr. Greene's travel and registration costs were paid through the NASA AP2 Program.

The last time JG-PP was presented at the Logistics Conference was several years ago.

The Working Group agreed to not exhibit the JG-PP booth at the Logistics Conference.

Discussion:
Mr. Greene provided the JG-PP overview briefing in the afternoon of Day 1 of the Logistics Conference (August 31). The PowerPoint slide presentation was divided into the following sections:

- Overview of JG-PP program
- Example JG-PP projects
- Opportunities for involvement in JG-PP.

(PowerPoint file is attached.)

The JG-PP overview presentation was well received. No comments were provided from the audience. The audience for the JG-PP presentation was small—less than 25 people.

The afternoon of Day 1 was organized into four concurrent sessions. This meant that the entire 300 or so attendees were split among 4 rooms. The low turnout in the JG-PP session was likely due to audience members' choice to attend competing presentations on best practices.

Following are notes from some miscellaneous panel discussions and technical presentations.

- Clay Jones, CEO, Rockwell Collins, stated that for all that companies like Rockwell Collins have done to implement and benefit from acquisition reform, reform has stagnated and needs to be reinvigorated. Mr. Jones feels that more needs to be done to encourage more companies selling commercial items to qualify for military use. He also stated that few Government contracts are Time & Materials, which discourages many commercial firms. Rockwell Collins is in charge of configuration control (to meet form, fit & function) on virtually every Collins commercial contract, but not many military contracts. Finally, he would like to see performance-based logistics (including long-term contracts and incentives) assigned to contractors.

- Jack Harris, Director of Advanced Manufacturing Technologies, Rockwell Collins, highlighted the importance of collaborations in new technologies, and specifically mentioned the efforts of the ACI in lead-free solder.
- ACI discussed their collaborations in electronics, including:
    - Development of an electronics qualifications database in concert with Rockwell Collins, Raytheon, and Boeing. The database presently contains about 10,000 entries containing data on thermal cycling, vibration, and other test results for a variety of compounds and components.
    - Industry survey results, among which include:
        - The needs for sharing of excess components
        - The need for information on lead-free content of components
        - The need for tracking electronics trends, such as component obsolescence
- Lee Whiteman, ACI, discussed the impact of lead-free soldering on logistics support. (Note: His audience was no bigger than for the JG-PP presentation.) Of note:
    - The following acquisition/sustainment announcements have made relative to lead-free solder:
        - Airbus A380 – Announced it will comply with EU lead-free legislation
        - DD(X) Program – This next-generation surface combatant ship, in development for the U.S. Navy, is investigating lead-free electronics
        - JSF (Joint Strike Fighter) Program – Considering using lead-free hardware
    - COTS (commercial-off-the-shelf) manufacturers are not obligated to notify purchasers of the type (metallurgy) of lead-free termination finish on components
    - Among the defense system sustainment issues are:
        - How long will components be available in tin-lead?
        - Will components withstand higher soldering temperatures?
        - Will lead-free introduction interfere with tin-lead hardware?
- Robert Kidwell, Vice President of ManTech Enterprise Integration Center, cited three key ingredients to a good partnership:
    - The sum of the parts must provide a greater outcome than doing the work apart (1 + 1 = 3)
    - Buy-in from all levels of the corporation
    - Mutual respect
- A highlight of the Logistics Conference was a compelling talk by Brig. Gen. Scott West, quartermaster General of the Army, on his observations overseeing logistics for the war in Iraq (see attached newspaper article).

Much of the conference seemed to cover broad, thematic issues now or soon affecting the logistics community, and not so much on tangible solutions to logistical problems. As such, while the paper and presentation on JG-PP filled that niche, it seemed to be lost in all the other more opinionated discussions.

As a final observation, the exhibition area was small and did not appear to be all that well attended by registrants

Summary and Conclusions:
Presenting at the 2004 Logistics Conference provided an opportunity to present an update of JG-PP's activities and to reach new people. Although no new leads came out of this conference, the JG-PP paper will be published in the Conference proceedings and may invite future comment. It is worth noting that JG-PP's presentation at the Logistics Conference came via unsolicited invitation, specifically from a team member on an active supported JG-PP project. While this may not happen often, it's a positive statement as to the good reputation that JG-PP continues to have in carrying out projects that positively affect the bottom line of participating stakeholders.

The timing of this Conference was good in that JG-PP has an active supported project on lead-free solder, and lead-free solder was mentioned several times during the conference, including by the CEO of Rockwell Collins. Focusing part of the JG-PP paper and PowerPoint presentation on lead-free solder issues was a wise choice by the Working Group.

The downside of the Conference was the high-level (none detailed) nature of most presentations, the relatively small attendance, the apparent lack of real interest in JG-PP by attending logisticians. Part of the low attendance could have been due to location and partly due to timing (near end of government fiscal year).

Recommendations:

6. Accepting speaking invitations (especially if they come with reduced registration fees, as this one did), can be an effective means of marketing JG-PP.
7. The SOLE Conference is the kind of event that JG-PP might consider attending, and ideally presenting a paper at, every few years as fresh JG-PP accomplishments occur. However, covering the conference any more frequently is not necessary.

Action Items:

1. Provide personal observations and recommendations related to the 2004 Logistics Conference at a future JG-PP Working Group forum. (Brian Greene)

Brian E. Greene
ITB, Inc.
10/5/04

Trip Report
NDCEE PMR and Information Exchange
September 14-15, 2004

Location: Washington DC. Crystal City Double Tree Hotel

Objective: Attend the National Defense Center for Environmental Excellence Program Management Review and Information Exchange

Attendee: John Herrington

Background and Rational for Trip: To garner information applicable to JGPP methodology and evaluate possible benefits or technology transition for Marine Corps and NASA interests.

Security: A nondisclosure agreement had to be signed prior to attending the meeting, so detailed information may be company sensitive.

Discussion: The meeting was held in the Double Tree Hotel in Crystal City, Washington DC. The Program Management Review (PMR) took place on 14 September and the Information Exchange followed on 15 September.

The PMR consisted of programmatic briefings of projects near completion or recently completed. Most of the projects were Army. These proceeding will be posted on the NDCEE website in the near future. I have a hard copy of the presentations that I will distribute locally as well. Project briefing topics were:

- -Bullet Catcher Range Maintenance Technology (Army)
- -Demanufacturing Electronic Equipment for Reuse and Recycling (Army)
- -Managing Army Technologies for Environmental Enhancements (MANATEE) (Army)
- -Sustainable Painting Operations for the Total Army (SPOTA) (Army)
- -Corrosion Preventative Treatment of Fielded Tactical Vehicles and Ground Support Equipment at Fr. Hood (Army)
- -Nonhazardous Solid Waste (Army)
- -NDCEE Technology Transfer (general)
- -Sustainable Green Manufacturing (SGM) (general)
- -Unexploded Ordnance (general)
- -Biobased Hydraulic Fluid Evaluation (Military Tactical and Construction Grade Equipment) (DSC)
- -Commercialization of Technologies to Lower Defense Costs (general)
- -U.S. Army Kwajalein Atoll/Reagan Test Site Corrosion Control and Removal (Army)
- -Army Acquisition Pollution Prevention Program (A2P3) (Army)
- -Coatings Removal from Delicate Substrates and Application Process Improvements for Department of Defense Industrial Facilities (Navy)

Many of the projects briefed had general information of interest to both Marine Corps and NASA and most of the topics were familiar through JGPP. Some of the technologies could be possible technology transfers to the Marine Corps such as the Bullet Catcher Range Maintenance Technology; however the projects briefed did not disclose procurement costs or potential cost benefits. Some may be cost prohibitive based on benefits. Further investigation would be necessary from any interested parties to determine feasibility. A lot of data was covered in this one day portion of the meeting. If any topics are of particular interest, they can be followed up individually with NDCEE or their stakeholders.

The Coatings Removal from Delicate Substrates and Application Process Improvements for Department of Defense Industrial Facilities (Navy) project is investigating lasers for coatings removal. I had assumed that this project had tie in with the JGPP Handheld Laser project currently underway but that may not necessarily be the case. Ms. Christina Brown pointed this out and asked that Matt Rothgeb (NASA AP2) check to make sure that there was no potential duplication of effort between the two projects. The substrates are different, but it's worthwhile to check.

The Army project Corrosion Preventative Treatment of Fielded Tactical Vehicles and Ground Support Equipment at Ft. Hood may be of interest to the Marine Corps. The Army is coating their vehicles with a corrosion preventative compound prior to shipment overseas. This treatment could be applicable to Marine vehicles stored in war ready reserves. I will discuss this with Albany and Barstow MCLB's with the next week during a potential project telecom.

One item of potential interest to NASA and Marine Corps was contained in the Army SPOTA briefing regarding Rubber-to-Metal Bonding. This could be a technology information source regarding the subject. I'm certain this is an issue with vehicle armor and was being looked at with the Marine vehicles in Albany, and could provide established information for NASA if there are any interests in this area.

The second day entailed the Information Exchange meeting. The morning session entailed general briefings on how services generate and communicate requirements, how new technologies get into the POM cycle, roles of facility managers in technology transfer and some lessons learned. The afternoon portion of the meeting was to break up in to two groups and discuss "What Technology Transfer Barriers Do You Face and How Can They Be Resolved". One group focused on weapons systems and the other group focused on facilities. The order of the drill was to try and identify three main barriers to technology transfer. As the groups worked and discussed the issues, it became clearly evident that there are too many variables and project types are too diversified to narrow technology transfer issues down to just 3 main culprits. The barriers could range from the given, such as lack of funding, to the obscure, such as personality conflicts. Speaking with other meeting attendees, it became apparent that NDCEE was hoping to identify areas they could focus on to aid in transferring technologies that NDCEE had managed. I participated in the weapons system group.

Mr. Leitner was able to attend the morning session of the Information Exchange meeting. He was able to have some quick discussions with other service attendees and mentioned to me that keeping abreast of the facilities issues may be very valuable information sources for potential project information.

Contacts of Significance: Mr. Linwood Gilman, DSC-Richmond. Mr. Charles Pellerin, ESTCP/SERDP office.

Recommendations/Actions: Share applicable information on technologies and provide Mr. Rothgeb with information on laser decoating to insure no duplication of effort with JGPP.

John Herrington
ITB, Inc.